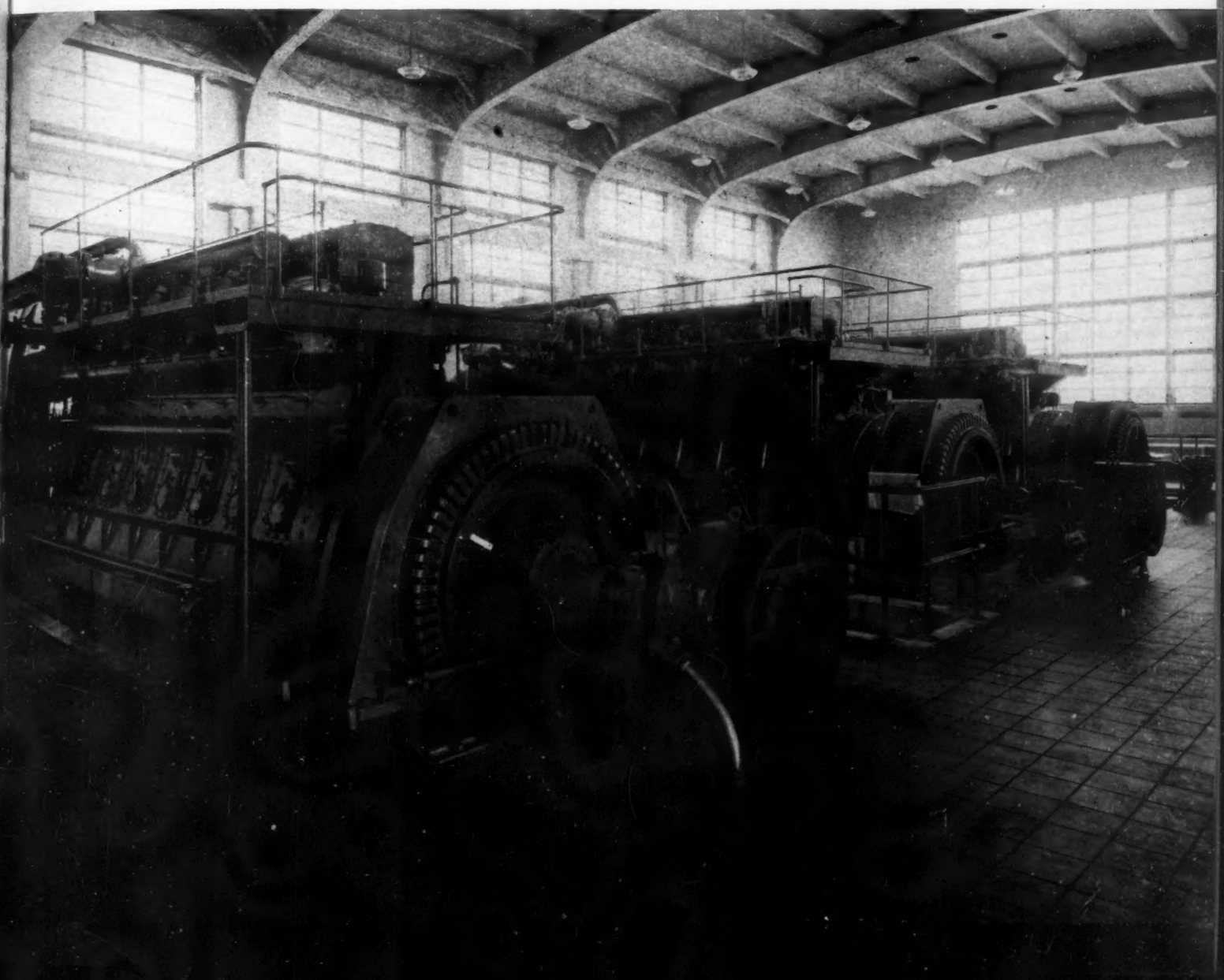
WATER WORKS & SEWERAGE

HBP ABC

POWER HOUSE OF NEW YORK'S ENLARGED CONEY ISLAND PLANT
Three 900-HP Worthingtons Direct Connected to 600-KW Generators



URGENT! IMPORTANT!
Return empty chlorine cylinders promptly
Chlorine production for WAR and PUBLIC HEALTH needs is hampered by idle, unreturned cylinders. Our supply of new cylinders is limited—help us make full use of those we have. Return empty cylinders without delay!

MUTE METAL WAS MADE TO SPEAK . . . . . ALMOST BY ACCIDENT

The alertness of Alexander Graham Bell, a teacher of human mutes, was vital to his discovery of how to make mute metal speak. Experimenting with a harmonic telegraph, he stumbled on the principle of the telephone, was quick to realize its value and to make long-distance speech a reality.

Alertness is important in our business, too. Whether developing a new chemical . . . or improving an existing product . . . or "trouble-shooting" in a customer's plant . . . our men show an alertness that adds new vigor to the solid reputation for integrity in chemical manufacturing which we have earned throughout American industry during the years since 1850.

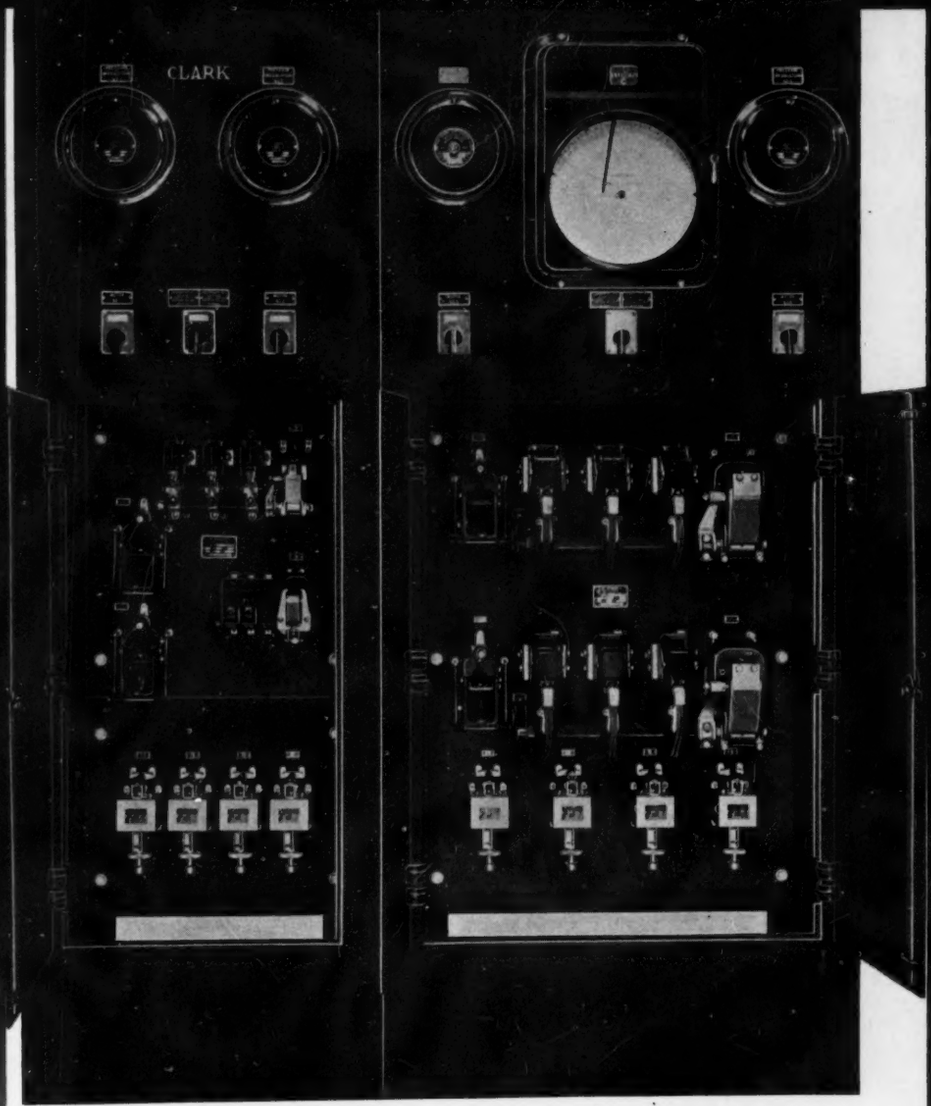
CHEMISTRY
IS THE KEYSTONE
OF INDUSTRY

PENNSYLVANIA SALT
MANUFACTURING COMPANY
1850 *Chemicals* 1942

1000 WIDENER BUILDING, PHILADELPHIA

BRANCH OFFICES: NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • WYANDOTTE • TACOMA
PLANTS: PHILADELPHIA • EASTON • NATRONA • WYANDOTTE • TACOMA • PORTLAND, ORE.

Dead Front for Safety—
"3C" Apparatus for Service!



At an Eastern Naval Air Station this "3C" Dead Front Panel is controlling one 15 H. P., 150 G. P. M., one 30 H. P., 350 G. P. M., and two 75 H. P., 1000 G. P. M. Salt Water Pumps.

The two Pressure Regulators to the left may be selected so that either may operate either of the smaller pumps; the other two Pressure Regulators may be selected so that either may operate either of the larger pumps.

Dependable Bul. 7700 A. C. Contactors in 50, 100, and 300 ampere sizes, insure efficient operation of this panel, which, when the doors are closed, is entirely Dead Front.

Bul. 7326 Inverse Time Limit Overload Relays provide adequate overload protection.

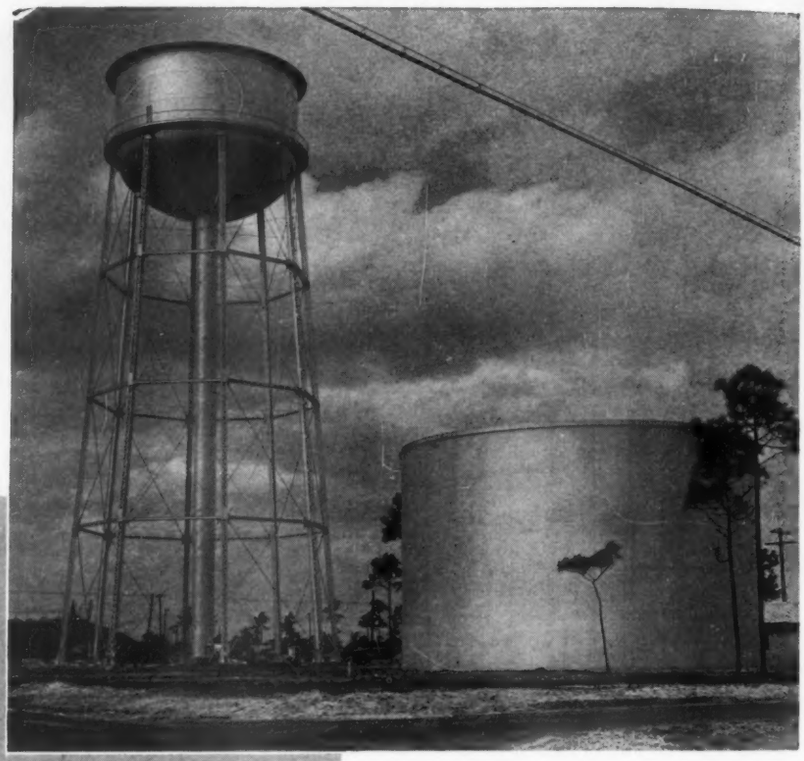
OFFICES IN PRINCIPAL CITIES

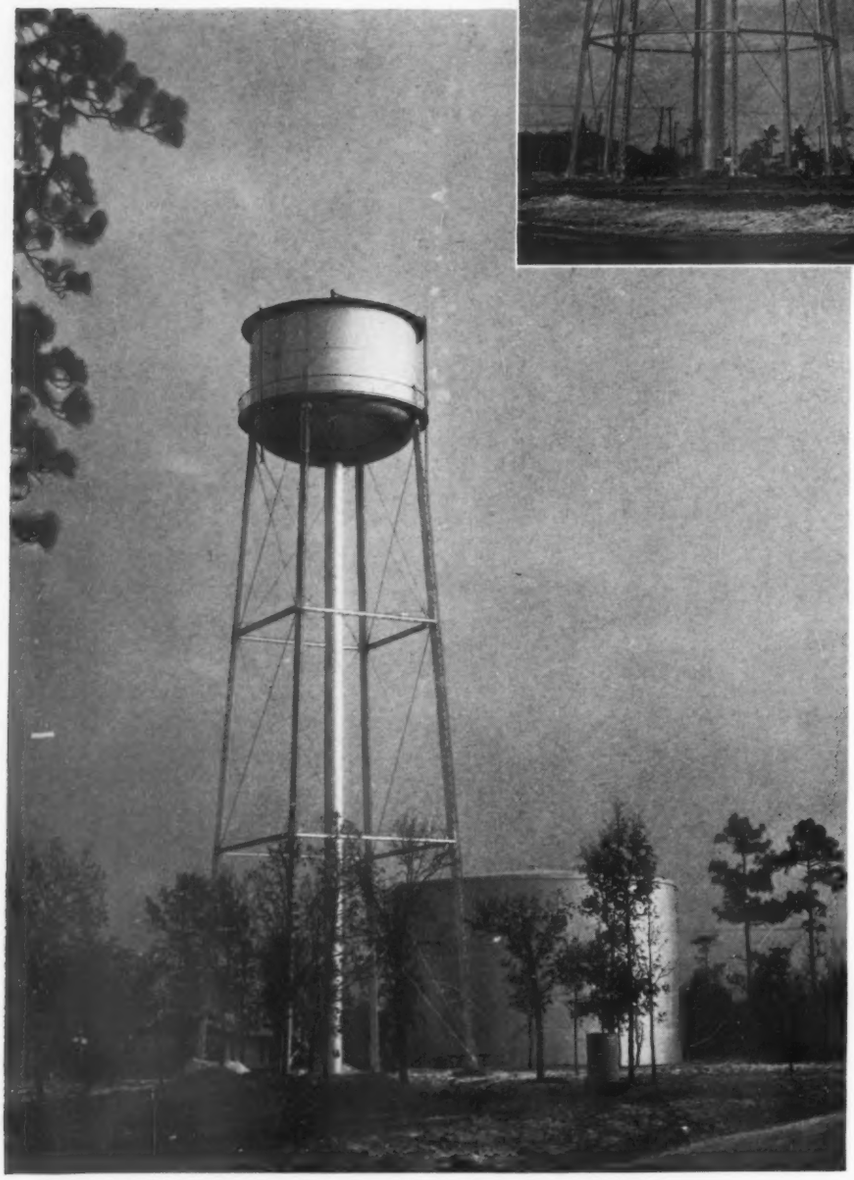
THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

WATER WORKS & SEWERAGE, February, 1942. Volume 89. Number 2. Published monthly at 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States $2.00 per year; Canada $2.00 per year; Foreign $3.00 per year. Copyright, 1942, by Gillette Publishing Co. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under Act of March 3, 1879.

STEEL TANKS for Water Supply....





These views show ellipsoidal-bottom elevated tanks and flat-bottom steel reservoirs used to provide water for general service and fire protection at a large Army training camp. Above: 500,000-gal. ellipsoidal-bottom tank and 1,000,-000-gal. steel reservoir. Left: 100,-000-gal. ellipsoidal-bottom tank and 1,000,-000-gal. steel reservoir.

PROVIDING a water supply for an industrial plant or a military camp is similar to building a water works system to serve a city. Steel reservoirs are utilized to provide adequate ground level reserves and elevated tanks are installed to deliver dependable gravity pressure in the mains.

Furthermore, the same general principles of distribution govern. The capacity of the elevated storage should be adequate to meet peak demands. The height to bottom should be sufficient to deliver the desired pressure. The tank itself should be located as near as possible to the center of demand.

Elevated steel tanks are built in standard capacities of 5,000 gallons to 2,000,000 gallons and flat-bottom reservoirs from 25,000 gallons up.

CHICAGO BRIDGE & IRON COMPANY

Chicago.....2193 McCormick Bldg.	Birmingham..1586 North 50th Street	Philadelphia..1644-1700 Walnut St.
New York.3390-165 Broadway Bldg.	Tulsa.....1646 Hunt Bldg.	Washington..632 Washington Bldg.
Cleveland.2262 Builder's Exchange	Houston.....5615 Clinton Drive	San Francisco....1083 Rialto Bldg.
Havana.....402 Edificio Abreu	Detroit.....1551 Lafayette Bldg.	Los Angeles...1455 Wm. Fox Bldg.

Plants at BIRMINGHAM, CHICAGO, and GREENVILLE, PA. *In Canada:* HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

"It gives me pleasure to advise you that your organization has been chosen to receive the flag of the Bureau of Ordnance and the Navy 'E' pennant in recognition of your outstanding efforts in the production of ordnance materiel vital to our national defense. Recent events have made this award of even deeper significance than any which have been made in the past."

Secretary of the Navy Frank Knox, in a letter to Monsanto.

"E" stands for teamwork!

Among the crews of Uncle Sam's warships and naval planes, the Navy "E" is one of the most coveted and respected honors the men of a single gun turret or an entire battleship can win.

It is a symbol, not of individual brilliance, but of championship teamwork . . . teamwork that only long, gruelling hours of actual practice could perfect.

The same tradition governs the award of a Navy "E" to an industrial plant.

The "outstanding jobs" which win an Ordnance Bureau flag and "E" pennant are not the work of one brilliant "lone wolf" in the research department—or a single, capable executive. They are the result of teamwork that only starts with the quarterback in the front office and includes every man in the organization to the policeman on the plant gate . . . teamwork that only long years in the peacetime service of industry could perfect to the peak of efficiency demanded by a nation at war!

Monsanto is proud to fly the Navy "E" in recognition of past performance . . . glad to accept the responsibility it imposes for future performance. MONSANTO CHEMICAL COMPANY, ST. LOUIS, MISSOURI.

MONSANTO CHEMICALS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Let "*Gardy*" *DuMore* Guard Your Pumping Costs

"Gardy" DuMore is only a symbol—but he's a mighty important symbol for you to know. "Gardy" represents the *extra* aid you get in keeping costs low when Gardner-Denver Double-Suction Centrifugal Pumps are on the job . . . the special design features that enable these truly *modern* centrifugals to establish such remarkable performance records. For increased pumping efficiency and reduced cost per thousand gallons pumped, get full specifications: write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER DOUBLE-SUCTION HORIZONTALLY SPLIT CASE CENTRIFUGAL PUMPS:

1 A forward step in pump design—built for today's needs and conditions.

2 Every modern hydraulic and mechanical feature that increases efficiency and lowers power cost.

3 Casings, impellers and other vital castings of GarDurloy—the modern high strength cast iron developed by Gardner-Denver metallurgists.

Adaptable to any type of drive, these pumps are designed for heads up to 350 feet.

A TYPICAL USER REPORT: ". . We are more than pleased with the design and performance of our Gardner-Denver Pump. Pumping 1200 g.p.m. against a 120-foot total head, the unit more than meets your guaranteed efficiency of 88%."

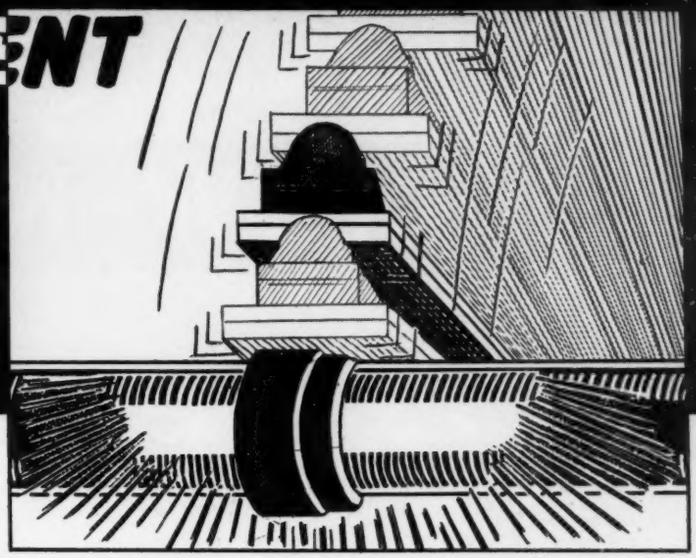
GARDNER-DENVER PRODUCTS HELP SPEED DEFENSE

GARDNER-DENVER *Since 1859*

How much PUNISHMENT

SHOULD YOUR BELL AND SPIGOT JOINTING BE ABLE TO WITHSTAND?

This *Tegul*-MINERALEAD Job took
FIFTEEN YEARS PUNISHMENT IN FIFTEEN HOURS
and didn't leak a drop!



The 4" pipe pictured formed a span of 19', supported only at the ends. The joint was centered under "hammer" formed of 50 lbs. of iron bolted to a wooden beam. Motor driven and cam actuated, this "hammer" pounded the joint for fifteen hours straight—90,000 smashing blows. The spring and recoil of the board *added* to the impact. Throughout the test, 90 lbs. water pressure was maintained in the line. When, at last, we shut off the motor and called it a day, there was still no sign of leakage.

IT'S REASONABLE—IN FACT CONSERVATIVE, TO FIGURE THAT THIS EXTRAORDINARY TEST CONDENSED INTO FIFTEEN *HOURS* MORE STRAIN AND PUNISHMENT THAN THE JOINT MIGHT EXPECT IN FIFTEEN *YEARS* OF NORMAL SERVICE.

QUALITIES PROVED BY LONG YEARS OF UNINTERRUPTED SERVICE UNDER HEAVY VIBRATION

Under highways and over bridges supporting 24 hour-daily heavy motor and railroad traffic, mains jointed with ***Tegul***-MINERALEAD have served for years without need of attention. Isn't this the kind of trouble-free service you want when you lay water lines?

Tegul-MINERALEAD is produced from sulphur plasticized with a synthetic rubber. ***Tegul***-MINERALEAD's advantages are in total unmatched in any other jointing compound, even of sulphur base. These advantages include:

LOWER INITIAL LEAKAGE and quicker sealing speed your laying job. This permits immediate backfilling, with quick elimination of traffic hazards due to open trenches.

SOUND ECONOMY—in both laying and maintenance. No skilled labor needed. Melting pot is replenished as job proceeds. The 10 lb. ingot form, packed five to carton, conserves space in shipping and storage. The ingot is also easy to handle. Wetting does not impair its qualities, hence it may be stored outdoors in any weather and without protection. The heavier components of the ingot cannot be shaken down by jolting in transit, so there can be no changing of composition, always possible in "powder" form compounds.

COST—You will find the cost of ***Tegul***-MINERALEAD a pleasant surprise.

WAR EFFORT—Using ***Tegul***-MINERALEAD you help conserve lead, an important strategic metal.

FURTHER USES—***Tegul***-MINERALEAD also serves for setting traffic markers in concrete highways and setting bolts, guard rails, etc., in concrete; jointing terra cotta, concrete Duriron and Transite Pipe.

AVAILABILITY—Stocks of ***Tegul***-MINERALEAD are maintained at points throughout the country, see list of branches. You can be supplied promptly. For technical literature showing the way to better and more economical jointing, address our main office here at Mertztown.

Tegul-MINERALEAD

THE ATLAS MINERAL PRODUCTS CO. OF PA. — The House of Jointing Materials — MERTZTOWN PA EST. 1892

THE **Atlas Mineral** PRODUCTS COMPANY OF PENNA. — MERTZTOWN, PENNSYLVANIA

*ATLANTA, Georgia
175 Spring St., S. W.

*CHICAGO, Illinois
333 N. Michigan Ave.

*DALLAS, Texas
3921 Purdue Street

*DETROIT, Michigan
2970 W. Grand Blvd.

*KANSAS CITY, Kansas
1913 Tauromee Ave.

NEW YORK CITY
280 Madison Ave.

PITTSBURGH, (10) Pa.
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TORONTO, Ontario
McRae Engineering Equipment, Ltd.
11 King Street, West

The ATLAS MINERAL PRODUCTS Company of CALIFORNIA — Redwood City, California

DENVER, Colorado
1921 Blake Street

HONOLULU, Hawaii, U.S.A.
Lewers & Cooke, Ltd.

*LOS ANGELES, Calif.
817 Yale Street

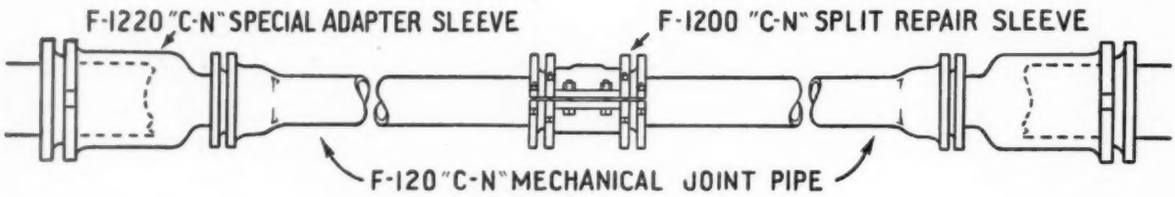
*SEATTLE, Washington
1120 Eighth Avenue, South

CLOW-NATIONAL

For Emergency Repairs...use

"C-N" MECHANICAL JOINT CAST IRON PIPE AND SPECIALS FOR QUICKLY RESTORING WATER SERVICE THROUGH A DAMAGED MAIN . . . . . .

F-1220 "C-N" SPECIAL ADAPTER SLEEVE



★ Damage to a water main can come when least expected—without warning—from freezing, from earth movement, from shock, or from DELIBERATE VIOLENCE. Regardless of the cause, it is of utmost importance that water service be restored quickly, and there is only one way that can be done—BE PREPARED—have materials on hand.

The line illustration shows a typical method of repairing extensive damage involving several lengths of underground water main. "C-N" Mechanical Joint pipe and "C-N" Specials make quick work of a job like this. All connections are made up by means of a wrench only. Any "handy-man" can do the job—quickly, easily, and regardless of weather or trench conditions.

F-1220 "C-N" ADAPTER
Sizes

3 x 3"	8 x 8"
4 x 4	10 x 6
6 x 6	10 x 10
8 x 6	12 x 12

Large end fits old A. W. W. A. pipe Classes A. B. C. D. and Modern Centrifugally cast iron pipe Classes 150 and 250.

F-1200 "C-N" SPLIT SLEEVE
Sizes
3 to 16" inclusive

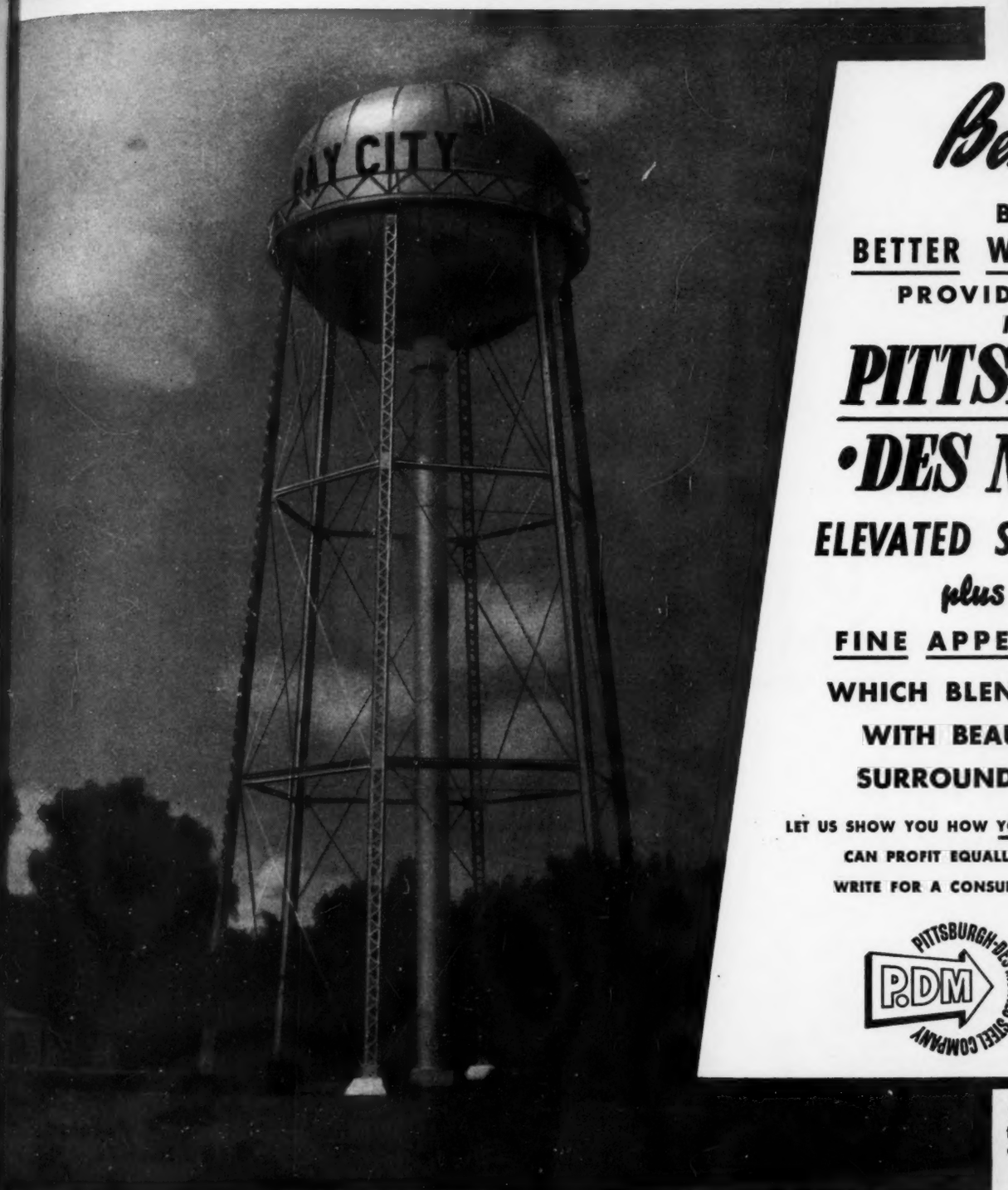
F-120 "C-N" PIPE
Sizes
3 to 24" inclusive
Classes 150 & 250 in 18' 0" Lengths

Stock up with "C-N" Emergency Repair Specials NOW

JAMES B. CLOW & SONS
201-299 N. Talman Avenue · · · Chicago

NATIONAL CAST IRON PIPE
(A Division of James B. Clow & Sons) Birmingham, Ala.

BAY CITY ☆ TEXAS



Benefits

BY THE
BETTER WATER SERVICE
PROVIDED BY THIS
NEW

PITTSBURGH •DES MOINES

ELEVATED STEEL TANK

plus

FINE APPEARANCE
WHICH BLENDS WELL
WITH BEAUTIFUL
SURROUNDINGS

LET US SHOW YOU HOW YOUR COMMUNITY
CAN PROFIT EQUALLY WELL.
WRITE FOR A CONSULTATION!

PITTSBURGH-DES MOINES STEEL COMPANY
P·DM

150,000-gallon P·DM Elevated Steel Tank . . . double-ellipsoidal design.

PITTSBURGH • DES MOINES STEEL CO.

PITTSBURGH, PA. 3418 NEVILLE ISLAND — DES MOINES, IOWA, 919 TUTTLE STREET
NEW YORK, ROOM 918, 270 BROADWAY • CHICAGO, 1222 FIRST NATIONAL BANK BUILDING
DALLAS, 1223 PRAETORIAN BUILDING • SAN FRANCISCO, 625 RIALTO BUILDING

by using STANDARD SILICATE OF SODA

SILICATE TREATMENT

Saves 47%

One water works adopted the Silicate of Soda treatment recommended by Standard Engineers and reduced the cost of chemicals from $4.41 per million gallons to $2.34 per million gallons. This 47% reduction, effected under normal operating conditions, represents savings that may be equalled or exceeded in your plant!

ALKALI

THE Standard Technical Staff will gladly help you overcome the adverse water conditions brought on by cold weather. When winter brings minimum water temperatures and maximum water densities, floc formation and settling are retarded. But the proper use of Standard Silicate of Soda will aid you by speeding the reaction and producing a larger, denser floc. Consequently, you will be able to make longer filter runs and effect substantial savings in your chemical consumption.

Investigate this modern cold weather treatment NOW!

DIAMOND ALKALI COMPANY • Standard Silicate Division

Plants at CINCINNATI JERSEY CITY
LOCKPORT, N. Y. MARSEILLES, ILL.
DALLAS, TEXAS

General Offices • PITTSBURGH, PA.

A week ago they would have LAUGHED!

That night they hung on every word!

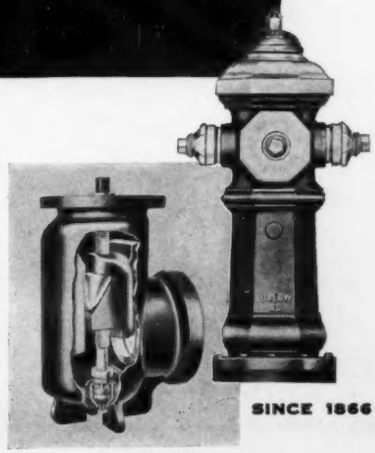
It was 8 p.m. in the town hall. A great change had come over these townspeople since December 7, 1941. As their local fire chief spoke, they listened with undivided attention—learning about incendiary bombs and what to do in an emergency — *just in case . . .* !

Emergency! . . . that's what hydrants are for! That's why Ludlow Hydrants, backed by half a century of dependability, provide *quick water* with least possible shock; proper shut-off *without water hammer; correct drainage;* and *easy inspection and servicing.*

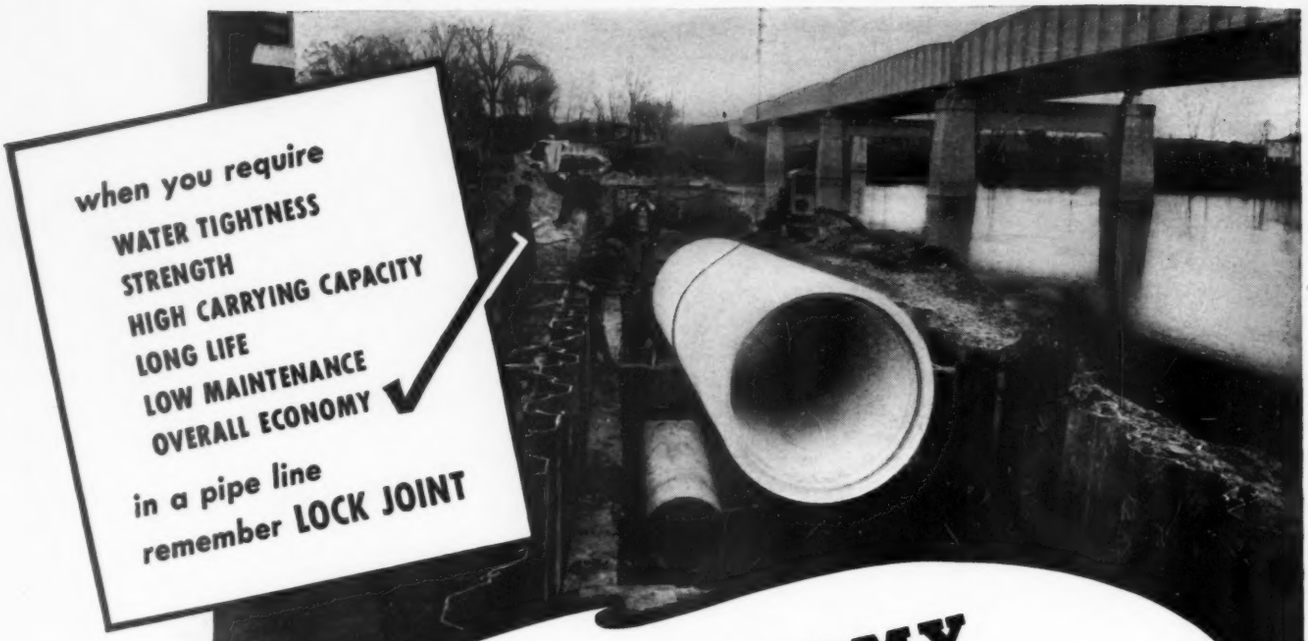
Consider Ludlow Hydrants for that new Defense Area! Catalog is yours for the asking.

THE LUDLOW VALVE MFG. CO., INC.
TROY, NEW YORK

Ludlow Construction. Self-releasing 30° angle wedges and free-floating gates, self-adjusting to seats, afford smooth, trouble-free performance, long service. Opening and closing of hydrant automatically opens and closes drain, located at lowest point. Clogging is prevented. Gate is wedge-locked, when closed, to prevent flooding. All working parts may be lifted through top of hydrant for easy inspection. Top and bottom bodies bolted together at ground line.



LUDLOW HYDRANTS



when you require
WATER TIGHTNESS
STRENGTH
HIGH CARRYING CAPACITY
LONG LIFE
LOW MAINTENANCE
OVERALL ECONOMY ✓
in a pipe line
remember LOCK JOINT

OVERALL ECONOMY

of any pipe line depends on { LOW INITIAL COST *plus* LOW OPERATING COST *plus* LOW MAINTENANCE }

LOCK JOINT REINFORCED CONCRETE PRESSURE PIPE insures the GREATEST OVERALL ECONOMY in your pipe lines because it has:

LOW INITIAL COST as evidenced by its long record of successful competitive public bidding.

LOW OPERATING COST resulting from its permanently high carrying capacity thereby producing constantly lower pumping cost and more gallons of water delivered per dollar of pipe line investment.

LOW MAINTENANCE due to its uninterrupted service and freedom from repairs even after 26 years of service.

LOCK JOINT PIPE COMPANY

Established 1905

AMPERE, NEW JERSEY

BRANCH OFFICES

Chicago, Ill. — Kenilworth, N. J. — White Plains, N. Y.
Cleveland, Ohio — Kansas City, Mo.
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PRESSURE SEWER — SUBAQUEOUS CULVERT

2-LI-5

fifty years of Mathieson Chemicals

An American Pioneer FACES THE FUTURE

● Fifty years ago, when Mathieson was established, all of the bleaching powder and most of the alkali used in this country were imported from England. Since 1892, when Mathieson began pioneering the domestic manufacture of these and other products, its original plant at Saltville, Va., has grown into three modern manufacturing units covering hundreds of acres of ground.

In the laboratory, in the plant and in the field, Mathieson chemists and engineers have been leaders in research and in the development of new products . . . in the adaptation of both new and old products to more efficient use in industry . . . in the modern transportation and low-cost distribution of chemicals direct to the consumer.

Today, the towering stacks of three great Mathieson plants are dynamic evidence of a half a century of progress in the production and distribution of quality chemicals. Strategically located at Saltville, Niagara Falls and Lake Charles, Louisiana, these three manufacturing units are in a position to serve consumers of alkali and chlorine products throughout the chief industrial areas of the country.

In 1942, on its 50th Anniversary The Mathieson Alkali Works is proud to rededicate its plants and personnel to a nation at war . . . confident that the vision and initiative which have made America strong will win through to victory.

MATHIESON CHEMICALS

CELEBRATING FIFTY YEARS OF SERVICE TO AMERICAN INDUSTRY AND PUBLIC HEALTH

THE MATHIESON ALKALI WORKS (INC.), 60 E. 42ND STREET, NEW YORK, N. Y.

First Line Of Defense For Public Health

EVERY community in the country is affected in some way by the National Defense Program. Manufacturing production is up. Factories are working twenty-four hours a day. In many instances populations have doubled almost overnight. The housing shortage is acute. And, as a result, the demands on the local water supply have multiplied in proportion.

In the light of this situation it is apparent that, in many instances, existing equipment, which for years has supplied normal needs, can no longer be depended upon to deliver pure water in sufficient volume. Yet public health must be safeguarded at all costs. It is our first line of defense. And an adequate supply of properly conditioned water to meet emergency demands is imperative.

Graver has specialized in the design and manufacture of all types of water conditioning equipment for more than thirty years. In the interests of National Defense you should check over your equipment today. Make certain that your facilities are adequate, efficient, and economical. And if you are confronted with any water treating problem, consult Graver at once. Our engineers will gladly make an analysis of water samples and submit unbiased recommendations.

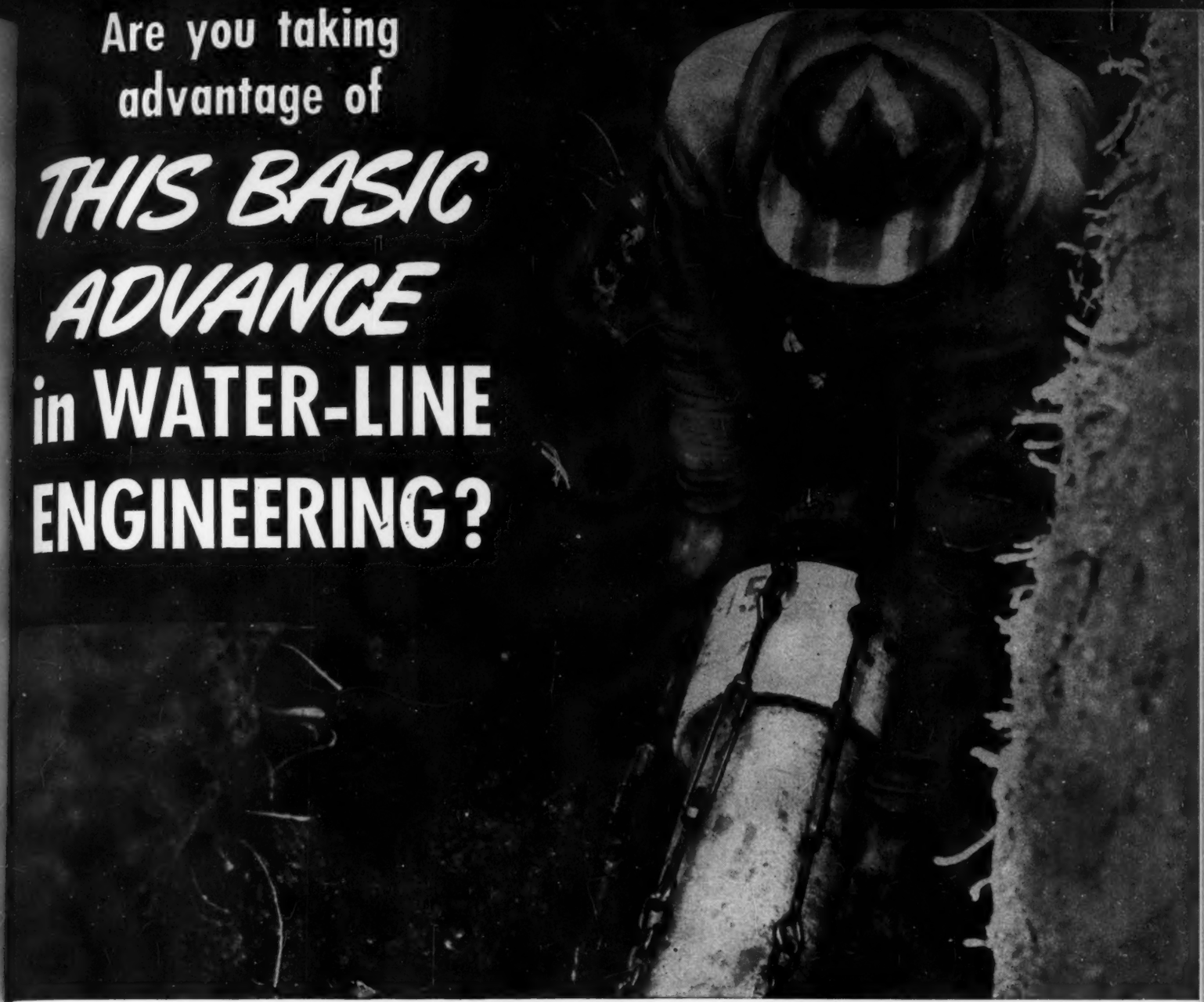
WATER SOFTENERS
FILTRATION SYSTEMS
CLARIFIERS
SEWERAGE DISPOSAL EQUIPMENT
STEEL STORAGE TANKS
VAPOR CONSERVATION SYSTEMS
WELDED CONSTRUCTION
FABRICATED STEEL AND NON-CORROSIVE PLATE

Built by GRAVER

GRAVER TANK & MFG. CO., INC.
4809-14 Tod Ave.
EAST CHICAGO, IND
NEW YORK CATASAUQUA PA
CHICAGO TULSA

42-12-W

Are you taking advantage of *THIS BASIC ADVANCE* in WATER-LINE ENGINEERING?



Hundreds of American communities are enjoying more efficient water service at lower cost with J-M Transite Pipe. Check these reasons why:

"Packaged" joint speeds up assembly. Transite Pipe is assembled with the Simplex Coupling, a prefabricated, "packaged" joint. No heating or caulking equipment is required on the job. In service, joints stay tight, even though assembly is so simple that unskilled crews can finish jobs in the shortest possible time.

Delivery capacity stays high. Transite's exceptionally smooth interior surface offers an initial high-flow coefficient, Williams-Hazen C=140. Because Transite is made of asbestos and cement, it cannot tuberculate. Carrying capacity stays high . . . pumping costs stay low.

Maintenance is negligible. Transite's asbestos-cement composition provides unusual resistance to corrosion . . . immunity to electrolysis.

• • •

For complete information on Transite Water Pipe, send for brochure TR-11A. Johns-Manville, 22 East 40th Street, New York, N. Y.

JOHNS-MANVILLE JM PRODUCTS

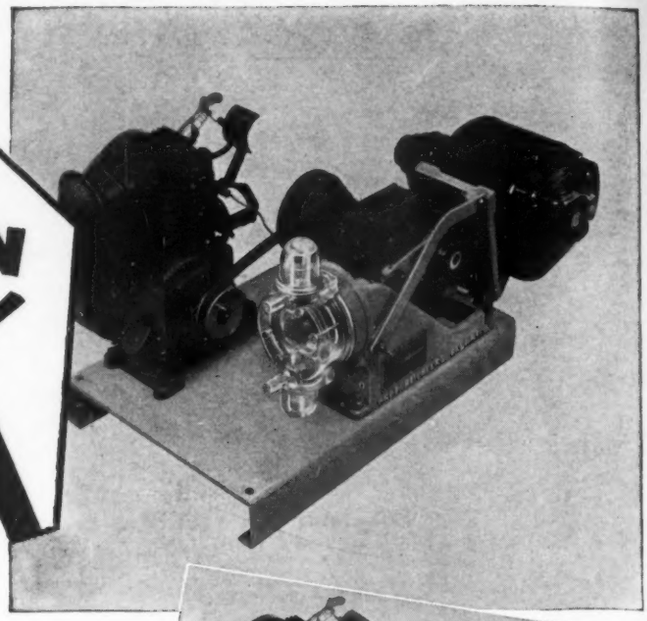
Johns-Manville TRANSITE PIPE

AN ASBESTOS PRODUCT

For efficient, economical water and sewer lines

EMERGENCY STERILIZATION *ANYWHERE!*

You can be prepared quickly—if you act now.



The pictures tell the story of %Proportioneers% Dual Drive (gasoline engine or electric motor) emergency Chlor-O-Feeders for:

EMERGENCY CHLORINATION — used to sterilize breaks, new mains, dead ends, floating reservoirs, and remote sections.

STANDBY CHLORINATION — to augment gas chlorinators during emergency overload periods or to replace them during repairs.

Dual Drive Chlor-O-Feeders provide complete chemical feeding emergency protection for water works.

Don't put all your eggs in one, EXPENSIVE, basket; have SEVERAL of these versatile emergency chlorinators on hand. Act now while there is time. Write "Emergency Chemical Feeder Headquarters" today.

Manufacturers of hypochlorites and priority rulings of W.P.B. indicate that hypo *will continue to be available*, for safeguarding public health, under A-2 preference rating W.P.B. order M-19.

Fig. 1— Heavy Duty Dual Drive Chlor-O-Feeder for pressures up to 85 lbs.

Price: **$330.00** delivered to your plant express prepaid.

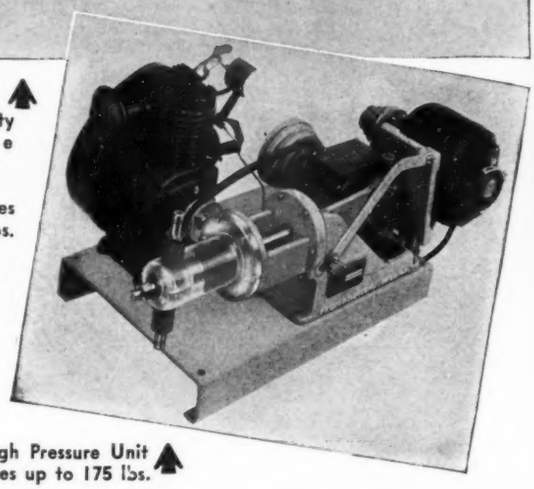
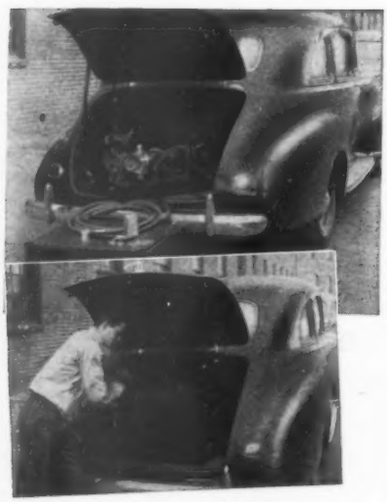


Fig. 2—High Pressure Unit for pressures up to 175 lbs.

For a *full* statement concerning the future availability of hypochlorites, see our ad on page 90 in this issue.



Figs. 3 and 4—Portable Emergency Unit fits easily in trunk of car.

%Proportioneers% Dual Drive Emergency Chlor-O-Feeder is the only moderately priced unit giving you these important advantages:

1. **FEEDS OVER 100 LBS. CHLORINE PER DAY.**
2. **ANY PRESSURE UP TO 175 LBS.—*no booster pump required.***
3. **PORTABLE—*LIGHT, EASY TO HANDLE*— see illustrations.**
4. **FEEDS ANY WATER WORKS CHEMICAL.**

%PROPORTIONEERS, INC.%

Emergency Chemical Feeder Headquarters

9 N. CODDING ST. PROVIDENCE, R. I.

WATER WORKS & SEWERAGE

PUBLICATION OFFICE
330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

"The Control of Aquatic Growths"

Is an article of interest at this season when plans should be made to cope with the widespread problem of summer aquatic growths of various water weeds along marginal areas of reservoirs and ponds that die and decay in the late summer and fall. Experiences and results with various methods experimentally tried in the eradication of prolific water-chestnut growths are cited. The cutting machine method, selected as the most positive and economical overall scheme is described, and suggestions are given concerning the most effective cutting operations and timing of the work. Also the scheme of handling and ultimate disposal of the cut material is described. The author—

CAPTAIN MAX LIEBER,
Sanitary Officer, Fort Belvoir, Va.

"Service Shooting"

Reveals the Elgin Method of clearing consumer service lines by use of an effective method of "shooting" the encrusted line with a charge of compressed air which scours the pipe interior without damage to the walls. The author—

LA VERNE TRENTLAGE,
Foreman, Meter Div.,
Water Dept., Elgin City, Ill.

"Disposing of Sludge as a Fertilizer"

Constitutes the experiences of a sewage works superintendent in a small city in demonstrating the value of digested sludge as a soil improver, and selling it locally. The reader will want to hear how "Oshkonite" grows tomatoes averaging 1 pound each and how sludge sales were built up from $156.85 the first year to $810 two years later. The contributor is—

R. W. FRAZIER, Supt. of Sewerage,
Oshkosh, Wis.

"Improved Design of Enslow Stability Indicator"

Is a description of a modification of the Enslow Continuous Stability Indicator involving the "Durham Contactor" which has recently been incorporated in the design now offered commercially. Also the article presents some practical notes on the operation and usefulness of the Stability Indicator after 1½ years of operation and observation. The author—

ROBERT S. PHILLIPS, Chief Chemist,
Water Dep't, Durham, N. C.

"Industrial Waste Treatment"

In this issue is another article of the series on treating various industrial wastes being contributed by E. F. Eldridge of Michigan State College. The next of the series will deal with the subject "Chemicals in Industrial Waste Treatment."

A forthcoming article will describe a successful method of "Treating Yeast Wastes," from the yeast and liquor industry. The author—

A. L. FALES, Metcalf & Eddy Engrs.,
Boston, Mass.

"Root Control With Sulphate of Copper"

Is a recital of experiences in eliminating root blockages in sewers with copper sulphate crystals added through house toilets. Not alone did the trials of chemical poisoning free the lateral sewers and house connections of the obstruction, but the effect was to produce a much fresher sewage more economically dealt with at the treatment plant. The author—

JOHN W. HOOD, Superintendent,
Sewage Treatment Works, Ridgewood, N. J.

"The Effect of Break-Point Chlorination on Filter Runs and Algae Growths"

Is a story of the effectiveness of break-point chlorination of a raw-water in eliminating algae growths from basins and filters and increasing the length of filter runs in addition to other advantages noted from the method. The author—

ALBERT A. WILSON, JR.,
Sup't of Filtration, Fredericksburg, Va.

"The Control of Destructive Sewer Gases and Odors"

Is a recital of experiences in controlling the generation of odors and destructive sulphide gases in sewers and at sewage treatment plants. The article reviews those methods available to sewage works managers and discusses the relative merits of each. It is believed to be the most concise but thorough article yet developed on this topic. The author—

CHAS. C. HOMMON, Supt.,
Sewage Treatment Works, Canton, Ohio.
(Also Consultant and Supervisor in Sewage Treatment.)

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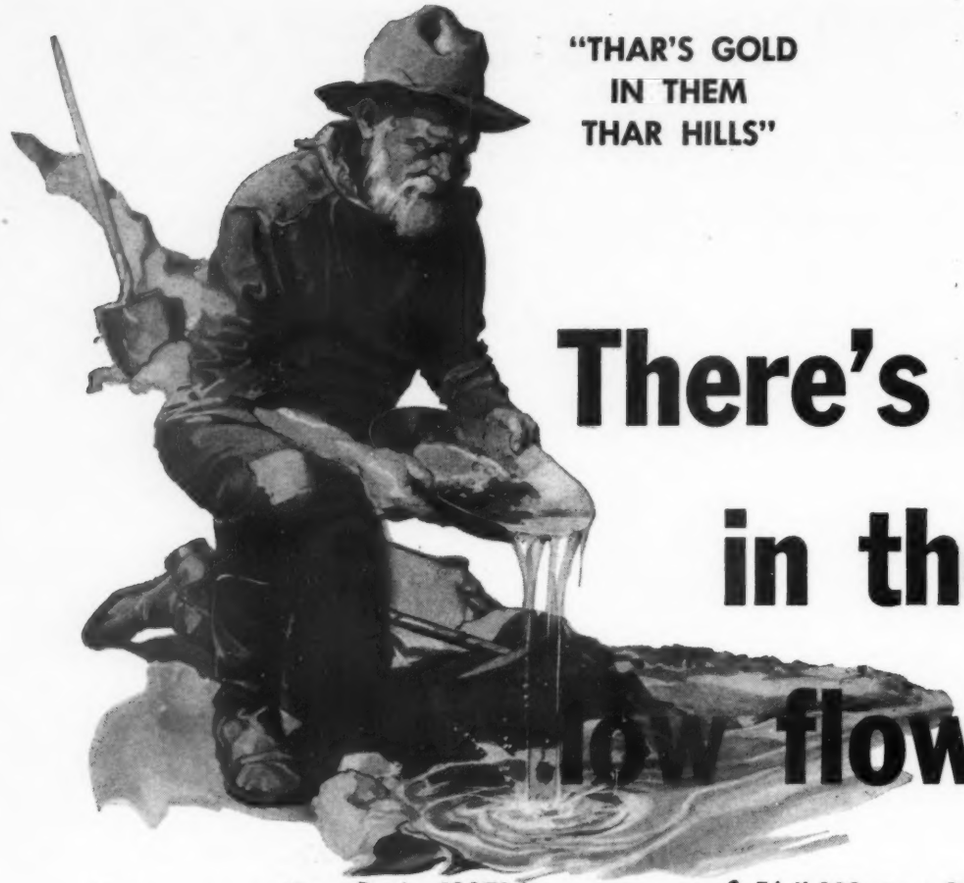

"THAR'S GOLD IN THEM THAR HILLS"

There's money in those flow flows, too!

LET'S MAKE THE MOST OF WHAT WE'VE GOT

WHEN a group of 5/8" Water Meters, untested for 26 years, was tested, repaired and restored to service, the Water Department of an Illinois City was promptly flooded with "High Bill" complaints! Service men reported the chief cause to be toilet leaks, averaging 1/3 gpm., adding some $4.30 per quarter to each normal water bill.

Analysis showed this leakage to total 43,200 gals. per home per quarter—all water wasted, and previously not paid for because of inaccurate, insensitive water meters.

Upon repairing these leaks, 99% of all bills dropped back to normal and water waste and pumping costs were reduced. The total parts-cost of repairing the 26-year-old meters averaged $4.45 per meter—in 18 months the meters paid for their repairs.

19

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WATER WORKS & SEWERAGE

VOL. 89, NO. 2 *A Gillette Publication* FEBRUARY, 1942

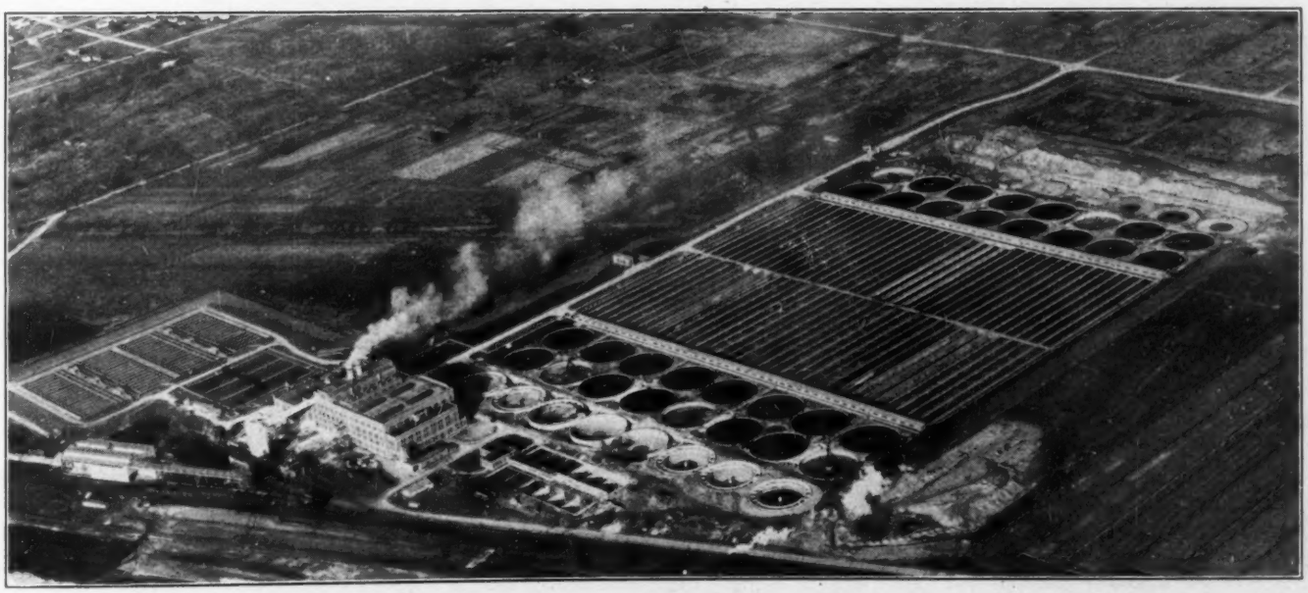
DEVELOPMENTS AND TRENDS IN SEWERAGE PRACTICES OF 1941

Reference to the Treatment of Sewage and Industrial Wastes

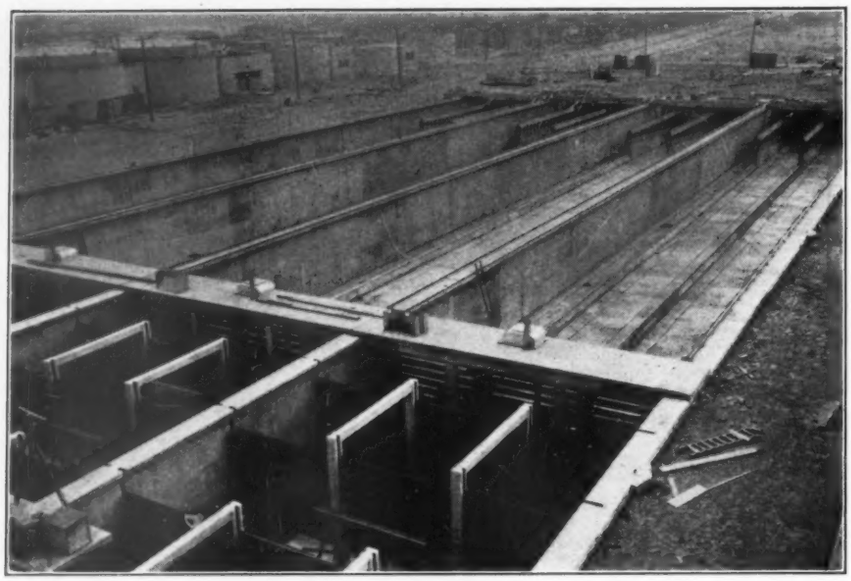
By SAMUEL A. GREELEY and PAUL HANSEN
Consulting Engineers
CHICAGO

A GENERAL review of sewerage and sewage disposal during 1941 must place deserved emphasis on the numerous projects in connection with the National Defense Program as well as recount municipal and industrial developments. Although the construction of new sewage disposal projects for municipalities was less in 1941 than in other recent years, there was still much of interest. Construction work in 1941 was decreased by the gradual cessation of the activities of P. W. A. There were, however, a number of projects, mostly small, built under W. P. A., amounting during the year to about 150 new sewage treatment plants or additions to existing treatment plants. At the close of 1941 W. P. A. work was also decreasing. Toward the end of the year a number of municipal projects in defense areas were sponsored and given financial assistance by the Defense Public Works Division of the Federal Works Agency under the so-called Lanham Act.

As regards municipal projects, it should be noted that the lull in design and construction activities has permitted or resulted in additional interest in investigations, reports, operations and rates of charge for sewer and sewage treatment service. In the municipal field some of the outstanding developments and trends are briefly noted as follows:



America's Greatest Sewage Treatment Plant
Chicago's South West Plant of 400 mgd. capacity is still undergoing enlargement as this very recent picture reveals.
(Photo by McLaughlin Air Service)

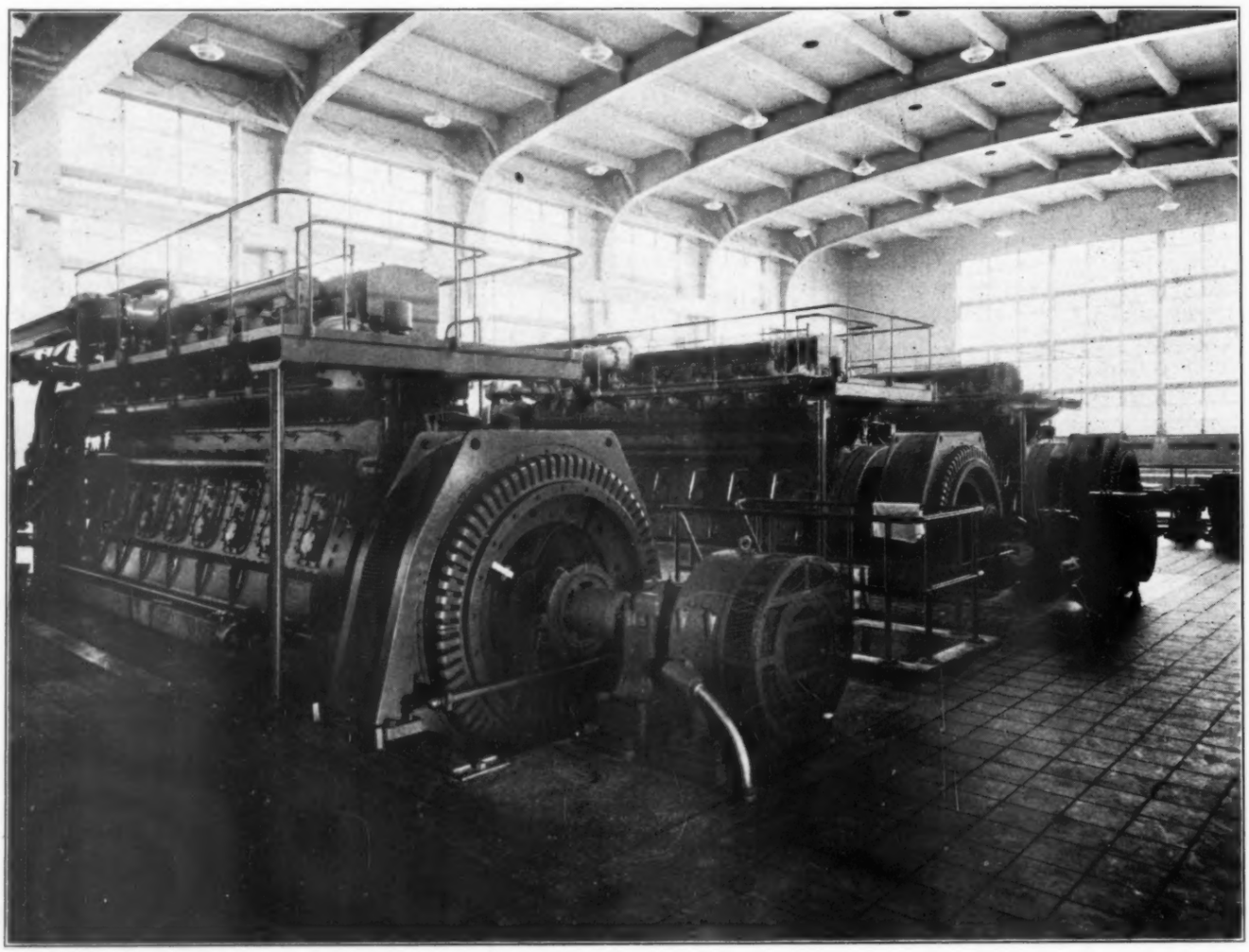


New York's Coney Island Plant

Is having its capacity doubled to 70 mgd. A Chemical Precipitation Plant, this picture shows the new Flocculators and Sedimentation Units. The latter will be equipped with Dorr Monorakes as sludge and scum mechanisms. In the background are six new "PFT" Floating Cover Digesters supplementing the eight original gasometer type digesters.

Ohio River Survey

The extensive pollution survey of the Ohio River by the U. S. Public Health Service and the Corps of Engineers entered its final stage during the latter part of the year. This is probably one of the most complete and extensive studies of the pollution of a river system that has ever been undertaken. It includes not only the Ohio River proper but also some nineteen major tributaries. Coincident with this has been the publication of outstanding reports on proposed sewage disposal projects in the Ohio Basin for Louisville by Metcalf and Eddy, and for Cincinnati by Havens and Emerson. The final report on the Ohio River Survey may be released during 1942. The Ohio River Compact is well under way and will go into effect as soon as ratified by Pennsylvania. All the other states—Ohio, West Virginia, Kentucky, Indiana and Illinois —have already taken favorable action.



Coney Island's Pump and Power House

The dependability of digester gas engines having been proven at the then largest installation at sewage plants, as the sole source of power, the Coney Island Plant enlargement involves the addition of three 900 H.P. Worthington engines direct connected to 600 k.w. generators.

Public Works Reserve

Lessons taught by post war dislocations in 1921 and by the depression years of 1932 to 1934 are reflected in the advance movement to create a public works reserve for work relief following present hostilities. This movement is being encouraged by the National Resources Planning Board. Under its stimulus many cities are preparing six year public works programs. Recently the Works Progress Administration has made available a fund of $2,500,000 to be administered by the Federal Works Agency for developing a public works reserve in the several states. State directors have already been designated for practically all of the states. During the war large expenditures on sewage treatment may not be warranted, but preliminary planning now being promoted is well warranted so that needed installations may go forward in a well conceived and orderly way at the most desirable time for providing work relief.

Southwest Side Plant—Chicago

One of the largest sewage treatment plants in the world went into operation late in 1940, namely, the Chicago Southwest Side Activated Sludge Plant. However, the tuning up and adjustment period carried through 1941. The plant comprises many interesting and special features, among which are the combination of power development with sludge dewatering and drying. Experience during the year indicated the desirability of some adjustments in the final settling basins and some increase in the sludge incinerating department.

New York's Bowery Bay Plant

The Pump, Blower and Power House for an ultimate capacity of 120 mgd. Activated Sludge treatment. Sludge disposal consists of digestion and barging to sea. This plant is also equipped with gas engines.

New York's Progress

The extensive program of sewage treatment for Greater New York made important progress during the year. The more significant accomplishments comprise the following:

An extension of the Coney Island works was completed and placed in operation. This increases the capacity of this plant from 35 mgd. to 70 mgd.—i.e., just doubled in capacity. The treatment comprises sedimentation in winter and chemical coagulation, sedimentation and chlorination in summer and represents the outstanding plant of this type in America.

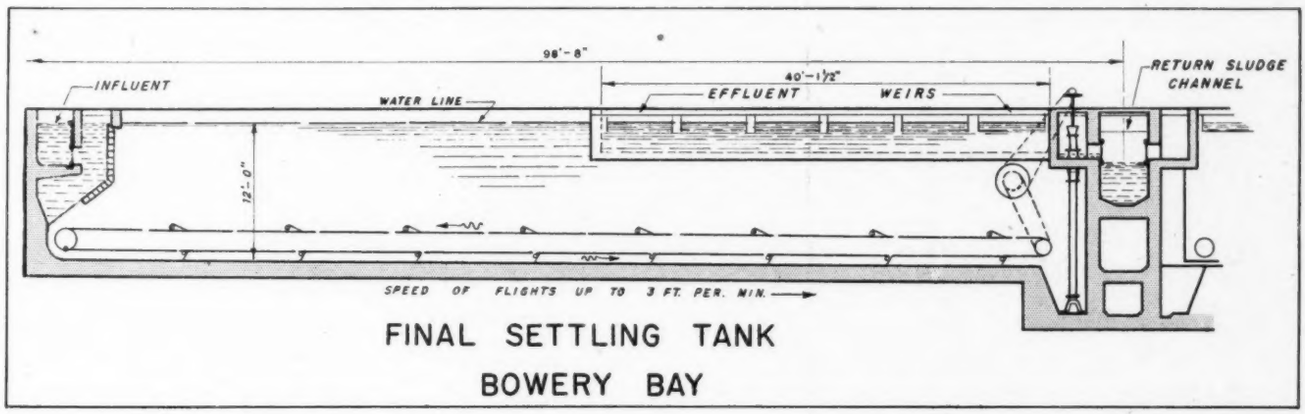
A small new treatment plant at Hart Island (capacity 1.5 mgd.) was completed and placed in operation during the late summer.

Jamaica Sewage Treatment Works, using the activated sludge process and having a capacity of 65 mgd., were brought near completion and are expected to be placed in operation in 1942.

Progress was made on the 26th Ward Sewage Treatment Works of the activated sludge type with a capacity of 60 mgd. This plant also is expected to go into operation in 1942.

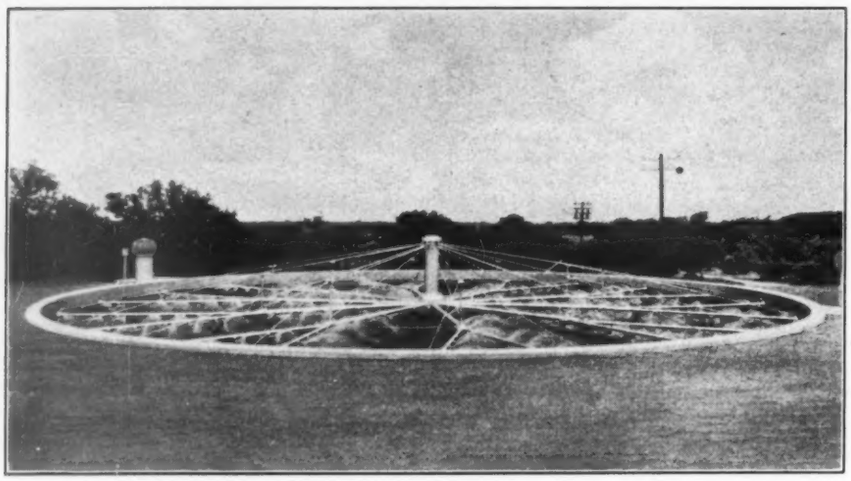
While the Bowery Bay Works (capacity 40 mgd.) were placed in operation late in 1939, the activated sludge elements were not completed until late in 1941 and complete treatment was not started until 1942.

An interesting form of tapered or stepped aeration, provided by the scheme of incremental dosing of the aeration units with settled sewage,



Novel Design of Final Settling Tanks for New York's Bowery Bay Plant

It is to be noted that the sludge travels with the flow to the sump at the effluent end of the tanks, not against the flow. Effluent weirs which serve 40 per cent of the entire tank area extend almost half way to the influent end where the incoming sludge laden liquor is directed toward the floor of the tank. The whole represents a radical departure in design worthy of attention.



At Camp Bowie, Texas
Another type of high-capacity filter—in this instance a 70 ft. diameter "Aerofilter" supplied by Chain Belt Co.

is in use at Tallman's Island Works and at Bowery Bay. It is also being tested experimentally at Ward's Island in parallel with conventional aeration. Results to date are not conclusive as to the economy and effectiveness of this arrangement, which seems to function more effectively with strong sewage than with diluted sewage. Further operating results will be observed with interest.

In the Bowery Bay Works an interesting departure in design and operation of the final clarifiers has been incorporated—see cut.

East Bay Cities Report

Toward the end of the year a Board of Engineers (Harold F. Gray, Charles G. Hyde and A. M. Rawn) completed a comprehensive report on sewage disposal for the East Bay Cities tributary to the tidal waters east of San Francisco. This report recommended treatment by sedimentation and chlorination with sludge disposal by digestion and mechanical dewatering.

Hampton Roads, Virginia

Incidental to greatly increased Federal activity in the Hampton Roads area a report made in 1938 by Greeley and Hansen is at present being reviewed by them and brought up to date preliminary to active steps for proceeding with construction under the Hampton Roads Sanitation Commission. Federal financial assistance has been assured.

Typical Army Camp Plant—Camp Wolters, Tex.
Is one of the high capacity filter equipped plants—Biofilters of Dorr Co. being employed in this instance—with a capacity of 1.25 mgd.

Chicago's Petition for a Temporary Increase in Diversion Is Denied by U. S. Supreme Court

This petition was heard by and argued before a Master appointed by the U. S. Supreme Court. It argued for a needed temporary increase of water diversion from Lake Michigan through the Drainage Canal until the final completion of sewage treatment plants in the Chicago Sanitary District. The Master ruled against the diversion, finding that, while a nuisance existed along the main channel and the upper reaches of the Illinois River, there was no health hazard sufficient to justify increased diversion. Due to increased industrial activity at the south end of Lake Michigan, pollution at the southerly Chicago water works intakes has increased to a point where it is feared that chlorination of the water without filtration may prove an inadequate barrier. Temporary increased diversion until completion of the South District water filtration plant is completed would greatly decrease the hazard at very small immediate cost.

Philadelphia

Continuing efforts were made at Philadelphia to finance much needed sewage disposal projects. Of particular interest were the court decisions relating to a proposed schedule of charges for sewage disposal service. A lower court finding was sustained by the Pennsylvania Supreme Court to the effect that the proposed two-part rate (one part based on water use and the other part based on assessed valuation), was not supportable under existing legal restrictions as presented to the Court.

Boston

General plans for the treatment of the sewage of the southerly part of the Boston Metropolitan area were completed, but general conditions have not as yet permitted financing the project. The Legislature, however, has created a special Commission for the construction of these works.

Pasadena

One of the first activated sludge plants in the United States was put into operation at Pasadena in January, 1924. Plans and specifications were completed during 1941 for rehabilitating and enlarging this plant. An interesting aspect is the decision to abandon the manufacture of fertilizer from the excess activated sludge and to dispose of the wet ex-

cess sludge through the trunk sewers of the Los Angeles County Sanitation Districts, which terminate in deep water well out in the Pacific Ocean.

Defense Requirements

As regards sewage disposal projects influenced by the Defense Program, these fall into two classes, as follows:

(1) Sewage and waste disposal for cantonments and defense industries.

(2) Increase in population loadings and industrial loadings requiring new or additional sewage treatment works due to defense establishments within or nearby.

Camps and Defense Industries

The energetic construction of Defense establishments began in the late summer of 1940 and was in full swing during the autumn of that year.

Two firms were employed by the Office of the Quartermaster General (namely, Greeley and Hansen and Metcalf and Eddy) to review the general situation and attempt within a matter of a few weeks to indicate the type of sewage treatment required at each of forty cantonments and to prepare a report which might, in effect, become a manual in connection with future design and construction relative to sewerage and sewage disposal. The task involved setting up some items of fundamental policy, as follows:

1. The cantonments were assumed to have an active life of five years. This, of course, does not apply to permanent posts or enlargements of permanent posts with permanent buildings.

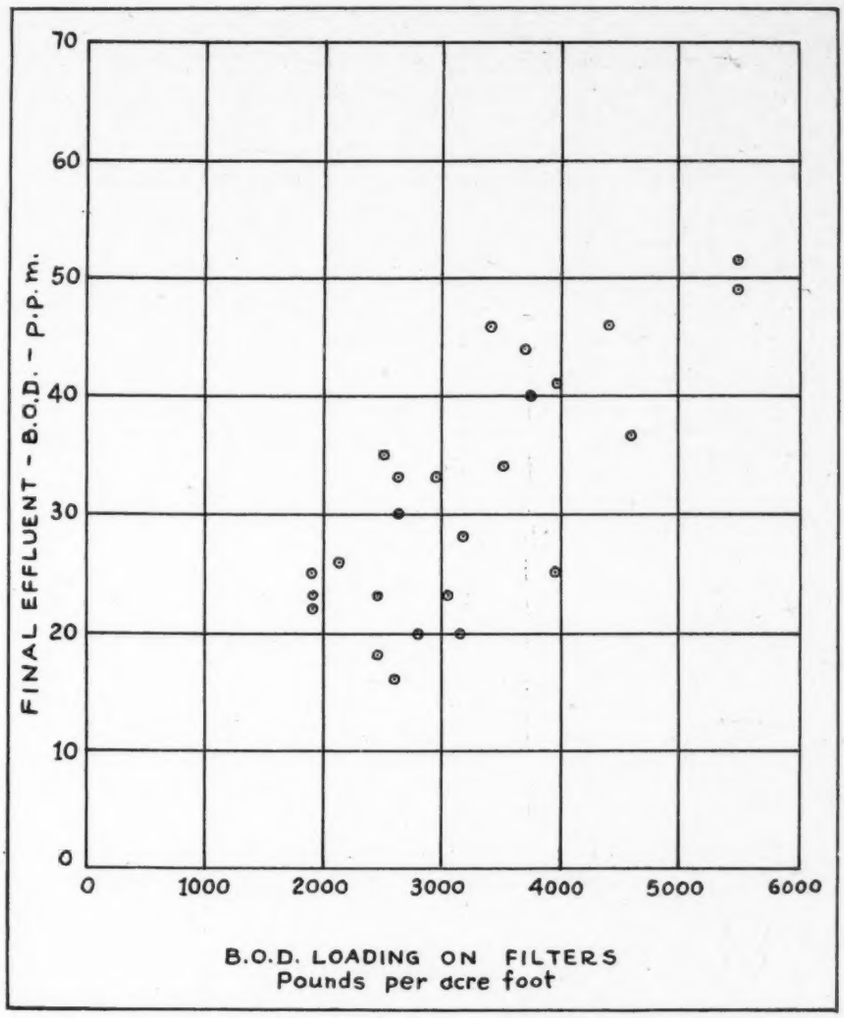
2. Public health must be positively safeguarded.

3. There must be no serious nuisance.

4. Economy must be exercised both because of the temporary character of the installations and because a minimum of funds should be used to meet requirements not directly essential to defense.

5. Competent operation must be made available.

In line with this fundamental policy, chlorination of effluents was recommended in all cases. In this way the public health could be safeguarded at minimum installation expense, though the temporary operating expense might be relatively high. Wherever dilution was adequate, sedimentation alone was regarded as sufficient, with, of course, suitable provision for sludge handling and disposal. Where a greater degree of treatment seemed necessary to prevent serious nuisance, the several types of high capacity trickling filters offered economy and reasonable results.



Performance Graph for High Rate Filter at an U. S. Army Camp
Note the extreme loadings at times but final effluent not in excess of 50 *ppm. B.O.D.*

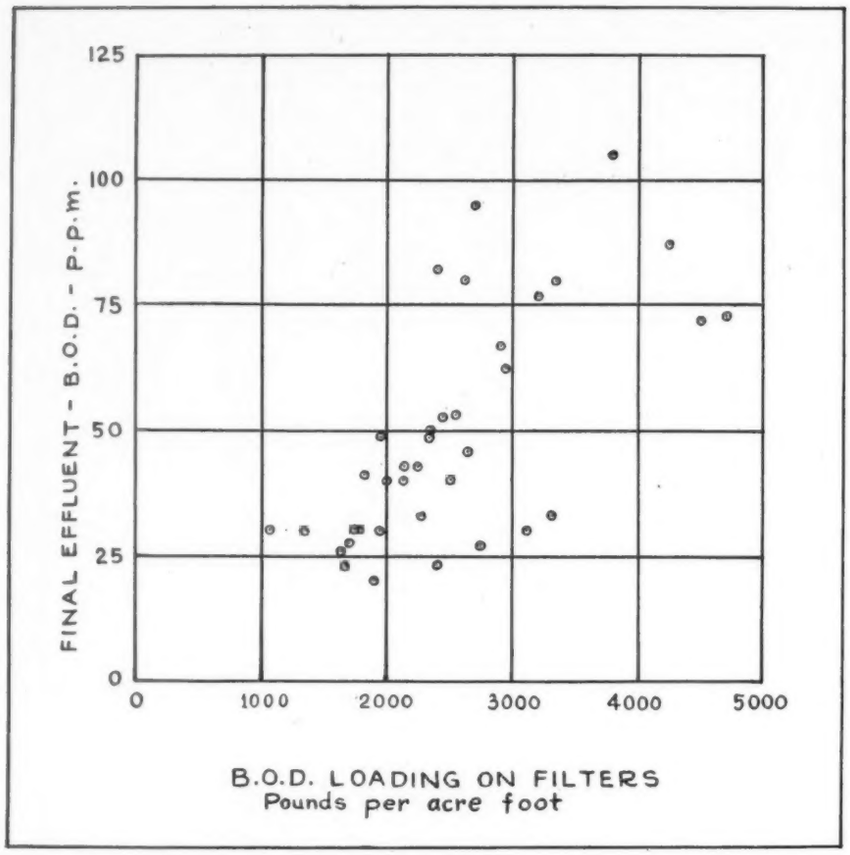
There was no attempt to rigidly prescribe the treatment in every instance and any treatment which, under local conditions, gave promise of good economy was accepted. For example, in certain localities in New England where suitable material was found in natural beds, intermittent sand filtration was regarded as suitable and economical. In a few instances because of prior developments along the receiving bodies of water, a relatively high degree of treatment was sought in conventional trickling filters with final sedimentation. In some instances, especially where there was a permanent post, the activated sludge process was deemed acceptable notwithstanding its elaboration and the requirements for highly skilled technical control.

There was relatively little available information regarding sewage disposal during the last war. Such as was available indicated the bases of design chosen, as revealed in Table I.

TABLE I

Bases of Design for Sewage Treatment Plans for U. S. Army Cantonments

Sewage Quantities, G.C.D.	
Average	70
Maximum—for several hours	140
Peak	210
Sewage Characteristics, P.P.M.	
Suspended solids	460
B.O.D.	290
Ether soluble	150
Per capita per 24 hours:	
Suspended solids	0.27 lb.
B.O.D.	0.17 lb.
Primary Sedimentation Tanks	*Hours*
Displacement period based on average flow sedimentation only or ahead of trickling filters. In case of high dilution of settled sewage 2.5 hrs. may be used	3.0
Ahead of activated sludge based on average flow	1.5



Performance Graph for Another High Rate U. S. Army Camp Filter
Without adequate explanation the performance picture at loadings above 2500 pounds of 5 day B.O.D. per acre foot at this plant indicate the wisdom of the 2500 to 3000 lb. limitations set for plants serving U. S. Army Camps.

Ahead of bio-filters, based on average flow:

(a) For a dilution ratio of 1:1.5 generally with single stage filtration 7.5

(b) For a dilution ratio of 1:1 generally with two stage filtration 6.0

Trickling Filters

(a) Standard, or low-rate trickling filters in southern locations with no severe winter, such as the Gulf Coast states and Southern California—not to exceed 5,000 population per acre-foot. With filters 6 feet deep, this is 2.1 M.G.A.D. average at 70 g.c.d. In northern climates loadings should not exceed 4,000 population per acre foot.

(b) High-rate trickling filters to have loads not in excess of some 3,000 pounds of B.O.D. applied per acre-foot, for camps in the south. This is equivalent to a population of 35,000 per acre-foot. In northern camps the loading should not exceed 30,000 per acre-foot.

Final Sedimentation Tanks

Flow not to exceed 800 gal. per sq. ft. per 24 hours, and not less than 2.25 hours' displacement, both based on the average flow, except when following two-stage bio-filters with recirculation ratio of 1:1 from the secondary tank effluent to the influent of the second-stage filter, in which case the capacity of the secondary tanks should be doubled.

Depth 10-12 feet with some reduction, or increase, in the depth in special cases.

The Plant of New London, Conn.
In the background is the Thames and harbor of this famed old maritime city which boasts America's greatest submarine base.

Sludge Digestion Tanks

For plants of the trickling filter type for primary and secondary sedimentation and with heated sludge tanks 2.0 to 3.0 cu. ft per cap.

For unheated sludge tanks in warm climates, add 25% to 50% to the foregoing, using the larger capacities in locations close to occupied buildings.

For plants of the activated sludge type, increase the foregoing allowances by 50%.

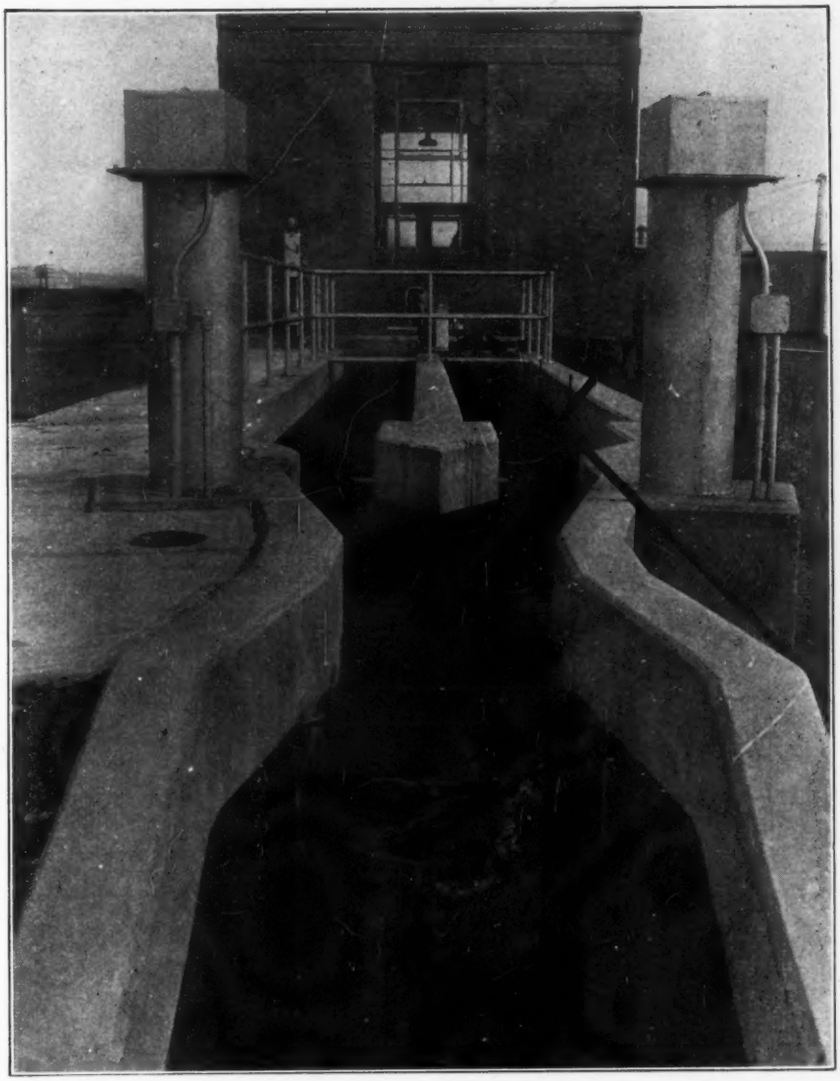
Sludge Drying Beds, or Lagoons

In warm climates and where the location permits, drying sludge in lagoons without underdrains or filter material is acceptable with 2.0 to 3.0 sq. ft. per capita.

Sludge drying beds with underdrains and filter material are also acceptable. For plants of the trickling filter type the area provided should be 0.5 to 1.0 sq. ft. per capita, and for plants of the activated sludge type this allowance should be increased to 1.0 to 1.5 sq. ft. per capita. The lower unit in each case applies to the most favorable conditions with opportunity for lagooning any excess sludge.

Records of performance are being studied as rapidly as they become available, and in the light of actual experience some modifications in these bases of design may be desirable. For example, the water consumption and, therefore, sewage flows are somewhat greater than anticipated. Escape of grease from the kitchens is also greater than anticipated even though rather liberal grease traps were used.

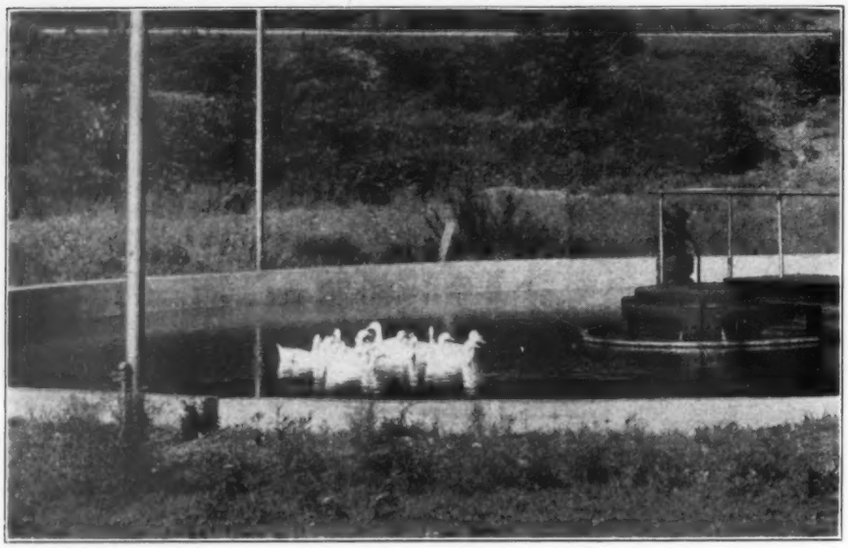
The character of trade wastes from war industrial plants has not become clearly apparent. It is known that the production of certain explosives produces wastes of an acid and organic character that greatly discolor receiving bodies of water. Evaporation and incineration are used for some of them as a means of disposal. Defense industries making iron and steel products produce acid iron wastes which also discolor the receiving body of water and clog air diffusers if introduced into the activated sludge process. Industries using copper and zinc produce wastes containing these metals in amounts that may affect water supplies or that may interfere with the operation of sewage treatment works if discharged into city sewers. Because of the present situation, little publicity is given to the nature of the processes conducted in defense industries and, hence, little information regarding the character of the wastes produced can be obtained. So far, it appears that most of these wastes may be discharged into larger streams, especially below water works intakes, without doing much harm. In other cases they may be neutralized with lime and settled, thereby producing a relatively inoffensive effluent.



Combination Grit Channels and Parshall Flume More Widely Used
This installation is at the Rutherford (N. J.) Joint Plant. Collecting flight deliveries to Link-Belt Washing Screw inside the grit house. In the foreground are the differential standpipers to the flume connected to "Chronoflo" Indicating and Recording Units.

Cities Affected by Defense Establishments

Installation of sewage treatment plants in cities that are adjacent to Defense establishments, or within which such establishments are located, are somewhat difficult to classify. Improvements have been aided and stimulated by the Defense Public Works Division of the Federal Works Agency, which, thus far, has been operating under an appropriation of about $150,000,000 for this purpose. Before Congress at this writing is a bill which will provide another $150,000,000 for extending the program. In all, there are about 63 such projects that have been approved and which will receive Federal aid. Seven of these were placed under construction in 1941. Presumably, many other applications had been received and were being given consideration before the year ended. The requirements of these cities vary greatly. At Tullahoma, Tenn., to meet the requirements of increased population adjoining Camp Forrest, the municipality has found it necessary to install a complete new water works and new sewage treatment works, together with necessary appurtenances. In other instances, as at Sioux Falls, the primary need is to care for increased production of packinghouse wastes, and this is being accomplished by an enlargement and modification of sedimentation tanks, sludge digestion equipment, new blower equip-



At Jeanette, Pa.
The boys say that it's "Duck Soup" to convince Mr. John Q. Public that the effluent from this final tank isn't half bad for swimming, if not for drinking.

ment, and the like. Also it was found necessary to equalize the flow of the industrial waste.

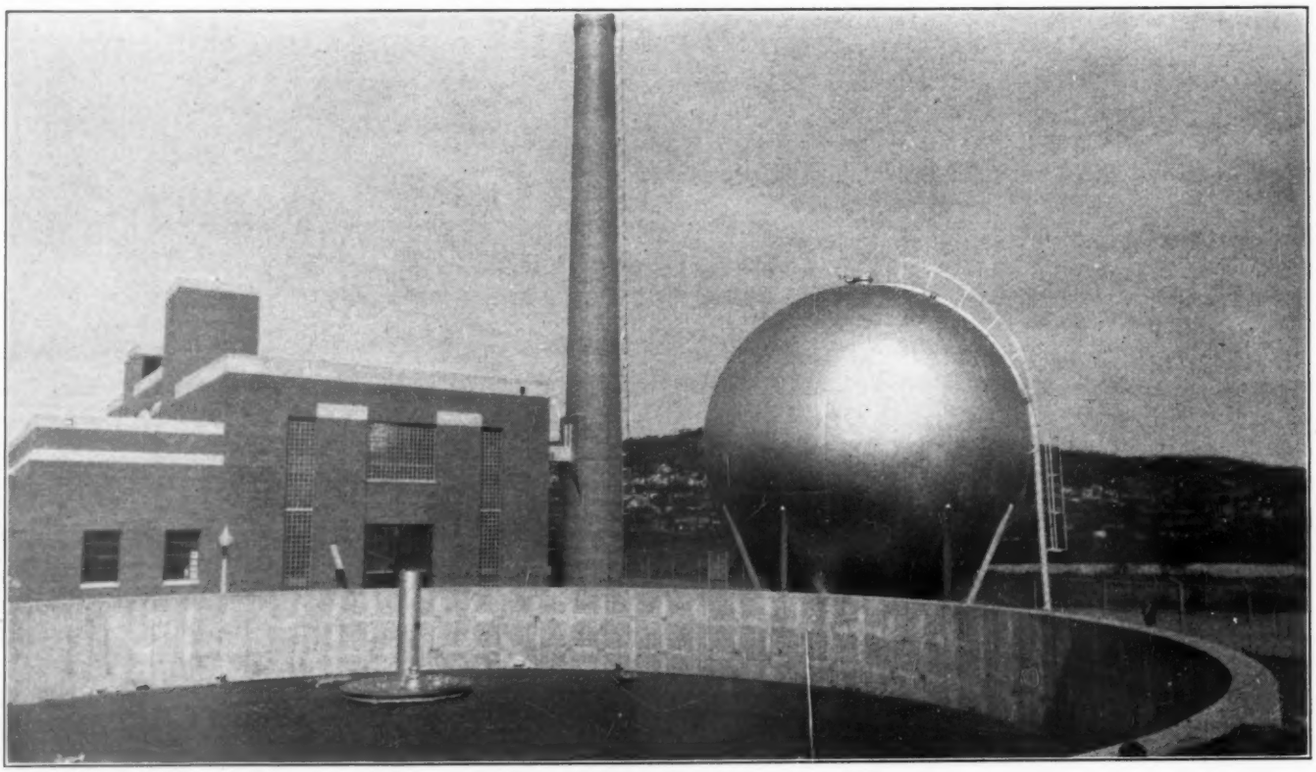
In a number of such cases, high capacity trickling filters have been found advantageous either as one stage in the sewage treatment process, as at Austin, Minn., or as the main treatment where so-called complete treatment is not essential, yet where something better than sedimentation is required.

At Houston the problem is somewhat unusual. Here one of the existing sewage treatment plants in the city has long been inadequate. The advent of defense industries, and consequent increase in population, has brought about an acute condition, particularly in the navigation channel of the port, which is more or less crowded with defense shipping. The waters of this channel were becoming so polluted as to foul ship bottoms, destroy paint, and endanger the lives of seamen.

Improved Operation

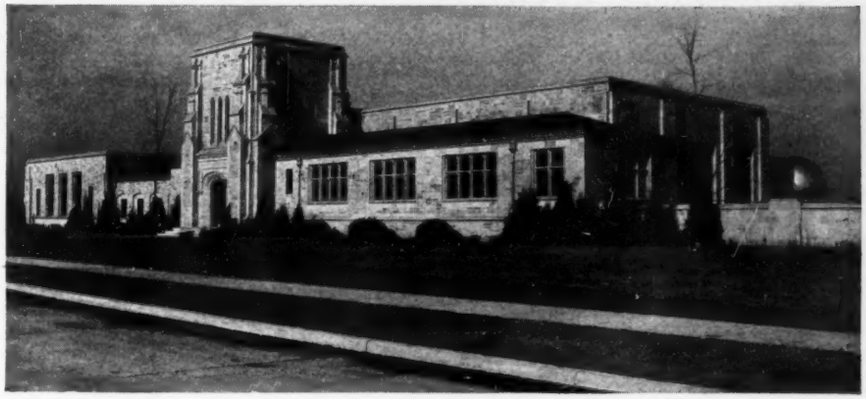
During the year 1941 there was a marked tendency in improved operation. This has resulted from two causes. One is the long trend that has been going on for years and which has been accompanied by extensive mechanization of sewage treatment processes, much of which would have been impracticable unless there had been developed a body of sewage treatment plant operators with good technical training. In part, trained operator supervision has also been caused by the necessity, in many instances, of getting the best operation possible out of existing works because of lack of funds for enlargement or extensive improvements.

Much work has been done by operating chemists looking toward the early publication of a revised edition of the Standard Methods. Of particular interest are the studies which have been made and the reports published on methods for the determination of grease. In fact, grease removal is one of the items of interest which has been under review during 1941 and bids fair to receive greater attention as a possible betterment in sewage treatment practice.



The New 12.5 M.G.D. Plant of Duluth, Minn.
The gas storing sphere beyond the floating cover digester supplies gas as needed for the C-E Raymond System for producing dry powdered sludge or drying and burning.

Mechanical equipment of modern sewage treatment plants has more or less forced operators to become acquainted with the idiosyncrasies of such equipment. The literature on sewage treatment during 1941 is replete with contributions, made by sewage works' engineers and operators, which recite efforts and means of overcoming difficulties with equipment and difficulties peculiar to individual plants and sewages.



A Sewage Plant?

Believed to be "'America's Handsomest Sewage Treatment Plant of the Year" is that of Fort Wayne, Indiana, designed along lines of this city's Water Softening Plant.

Worthy Report of Committee on Sewage Disposal

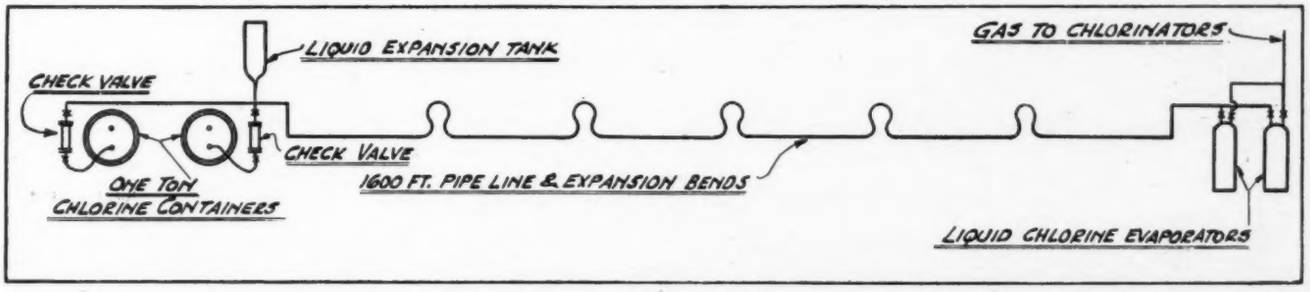
Outstanding is the report presented by Langdon Pearse, Chairman of the Committee on Sewage Disposal of the American Public Health Association at Atlantic City in October, 1941, on "Operation and Control of Activated Sludge Sewage Treatment Works" (*Sewage Works Journal*, Vol. XIV, No. 1, Jan., 1942). This report constitutes a thorough and searching review of operation and control. Significant is its reflection of the careful review by operators of the basic concepts of the activated sludge process, its chemistry and biology as an approach to more effective and economical operation. It deals with such items as air required per pound of B.O.D. removal, the relation of nitrates to performance and economy, short period aeration, maintenance of dissolved oxygen in aeration tanks, tapered aeration, step aeration, concentration of suspended solids, laboratory control, various plant routines, sludge reaeration, sludge bulking, disposal and/or utilization of excess activated sludge, diffuser plate clogging, influence of industrial wastes, chlorine applications, etc.

The Newest in Sewage Chlorinating Equipment

At Rutherford, N. J.—two 400 lbs./day W&T Chlorinators providing pre- and post chlorination through the new W&T Potentiometric System. By this control scheme (control unit and feed recorder at center) odor control and enhanced flocculation is provided with the minimum of chlorine requirement.

Settling Tanks

Streaming, short circuiting and rising sludge clouds are still troublesome in sewage settling tanks, both circular and rectangular. Behaviors are different for tanks of various sizes and for various volumes of flow in the same tanks. Operators have been seeking improvement through adjustments of inlet and outlet arrangements. For settling activated sludge or sludges of a light flocculent nature, overflow weirs set back from the ends of rectangular tanks or away from the walls of circular tanks have become firmly



Schematic Sketch of the Liquid Chlorine System of the Atlantic City Sewerage Co.

Here liquid chlorine is conveyed from ton containers in the mainland through 1600 ft. of exposed pipe line to the Treatment Plant on an island. The first installation of its kind has proven successful.

established as good practice. A trend toward a preference for rectangular tanks over circular tanks was observable during 1941.

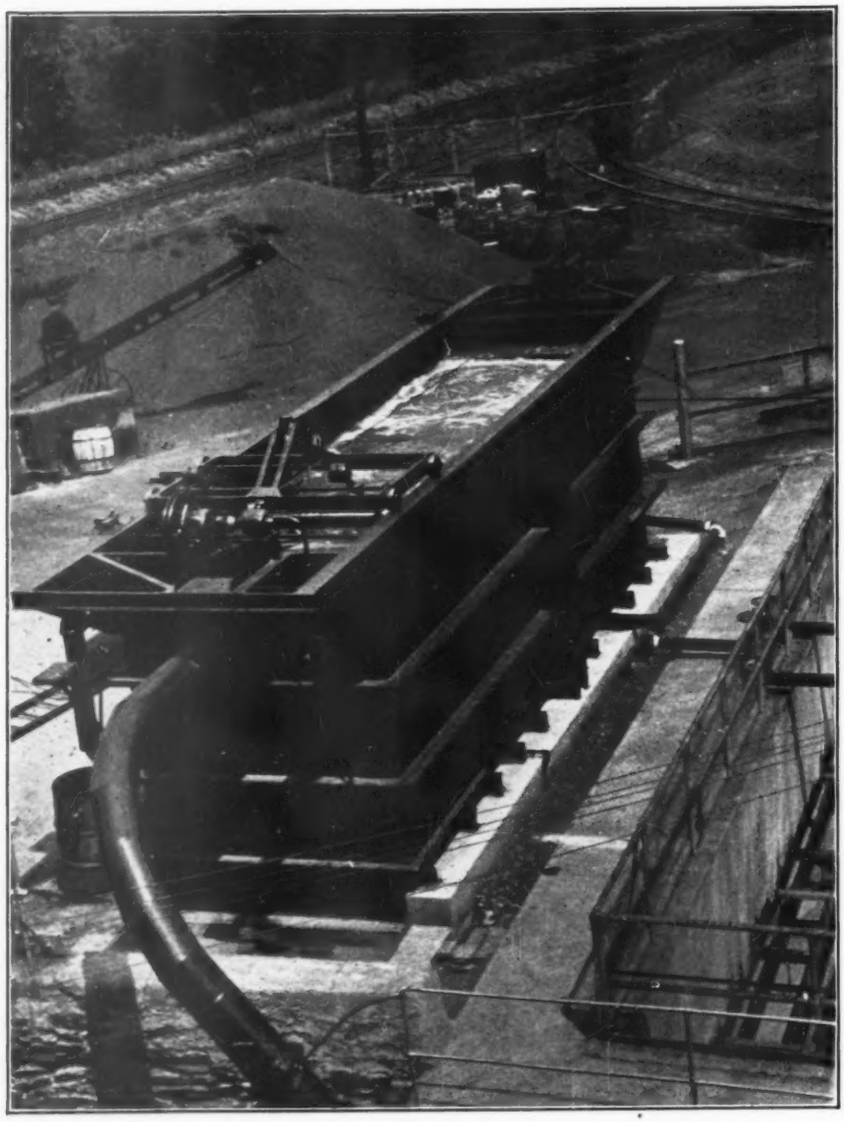
Grease a Problem

During the year there were no marked developments in municipal practice with reference to handling scum, oil and grease but at Army camps there has been a recrudescence of the acute grease problem noted at Army camps in the war of 1917-18. This results in part from an attempt to use commercial cast iron grease traps which are generally too small and inaccessible for handling grease from Army kitchens, and in part due to carelessness in pouring grease into refrigerator or other drains not equipped with grease traps. The recovery of grease at Army camps may become an important war economy.

Tapered Aeration and Incremental Dosing

During the year tapered aeration has been studied experimentally following its adoption at Salinas, California. It appears that the amount of tapering depends on the oxygen requirements of the returned activated sludge. According to Pearse, experiments indicate that about 45% of the air is needed in the first two hours, about 30% in the next two hours and about 25% in the next two hours for a six hour period. The figures vary somewhat widely. At the North Side plant in Chicago the initial oxygen demand is about twice the end demand, and in Milwaukee, with stronger sewage, the initial oxygen demand is about four times the final demand. And, as earlier noted, New York City observes a greater advantage from a form step or tapered aeration, through the method of incremental dosing of the aeration units, when the sewage is strongest or stalest.

While an adequate appraisal of the merits of tapered or step aeration or incremental dosing cannot yet be made, the small additional cost required to embody some means for using step aeration in one or another form gives the operator added flexibility for controlling the performance of his plant.



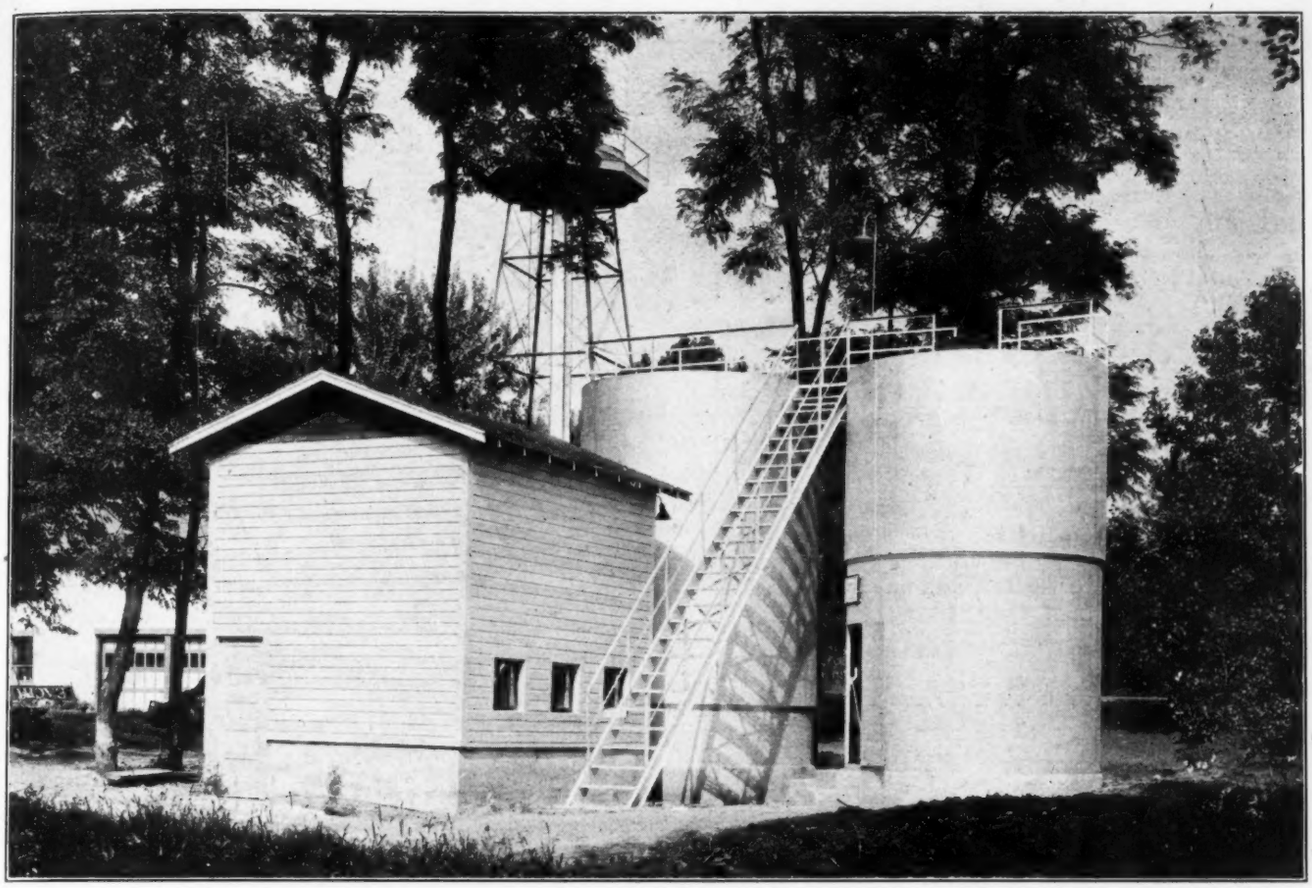
Combined Link-Belt Aeration, Skimming and Settling Tank
Developed for grease separation from wool-scouring and other wastes carrying greases or oils.

Diffuser Plate Clogging

Clogging of diffuser plates is generally associated with ferric hydroxide produced in the plate pores as the result of acid iron wastes entering the sewers, but not always so. High iron content is clearly the cause of plate clogging at the Calumet works of the Chicago Sanitary District, and was at the Cleveland plant. At the District's new South West Works the iron content has been low to moderate but clogging occurs within a matter of four or five months. Smoke and oily fumes are apparently the cause or a contributary cause of clogging in some places, and at others the difficulty is attributed to biological growths. In the latter cases adding chlorine gas to the air line at intervals has proven a successful, practical and economical remedy.

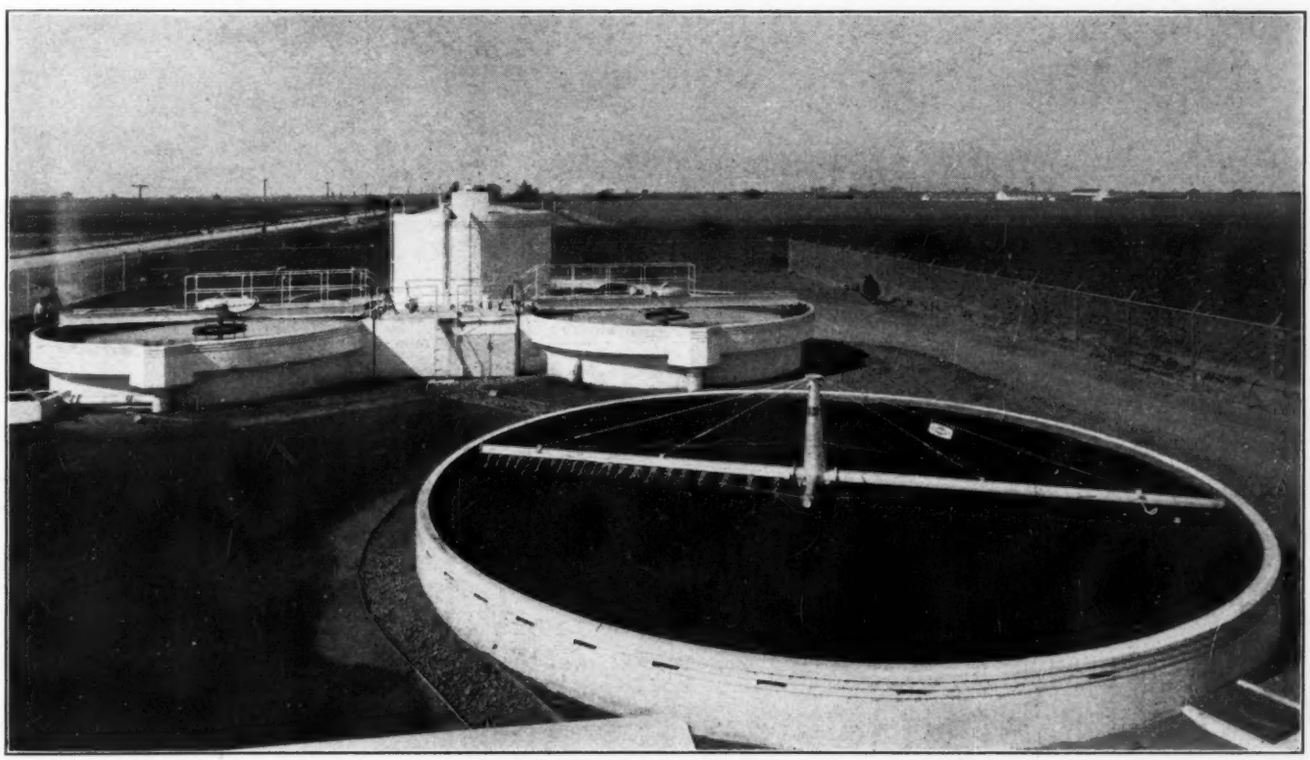
Sludge Dewatering

Much attention has been given to the care and operation of vacuum filters. A number of operators have written of their experiences and the comparisons of notes thus brought about has resulted in better operation, better care and improved economy. More notable are the studies at Minneapolis and Saint Paul by Schroepfer, which have shown that high poundage per square foot per hour and thick cake do not represent economical results but rather low poundage (that is, two to three pounds per square foot per hour and cake thickness of less than ¼ inch) represents best economy at that plant and results in very substantial chemical savings. He also proposes a rating index, expressed in pounds of solids per square foot of filter area in use, which will take cognizance of speed of revolution and will give a more accurate measure of performance. Schroepfer comments on the relatively large



Compact Milk Waste Treatment Plant—West Chester, Penna.

Employing the Mallory Oxidized Sludge Process, reported upon during the year by state authorities in Pennsylvania and Michigan as a dependable and evenly performing modification of the Activated Sludge Process.

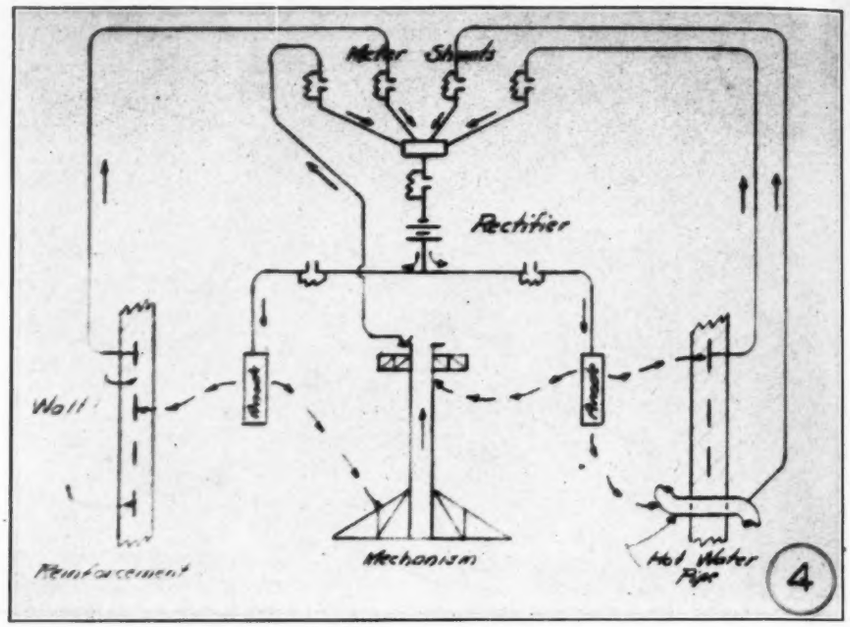


An Example of a Small High-Capacity Trickling Filter Plant

This plant involving the Dorr "Biofiltration" Process, with effluent recirculation and design capacity of a 5 mgd. of institutional sewage, serves 3,000 persons at the Stockton State Hospital in California. The single shallow filter, not much larger than the 30 ft. clarifiers, is only 45 ft. in diameter.

cost of preparing sludge for incineration and raises the question of eliminating, or partially eliminating vacuum filtration as a step in the process.

He also observes that for large plants dewatering and incineration is definitely economical, whereas for small plants it is definitely uneconomical as compared with sand sludge drying beds. He cautions that careful comparisons be made in the uncertain range of plants built to serve from 50,000 to 200,000 population. On the other hand operators at some of the smaller plants, notably C. T. Mudgett at Muskegon, Michigan, comment on the relative freedom from odors and the advantage all season operation which is to be gained by the use of vacuum filters. With all their faults and costs, according to Mudgett, they are still preferred to sludge beds.

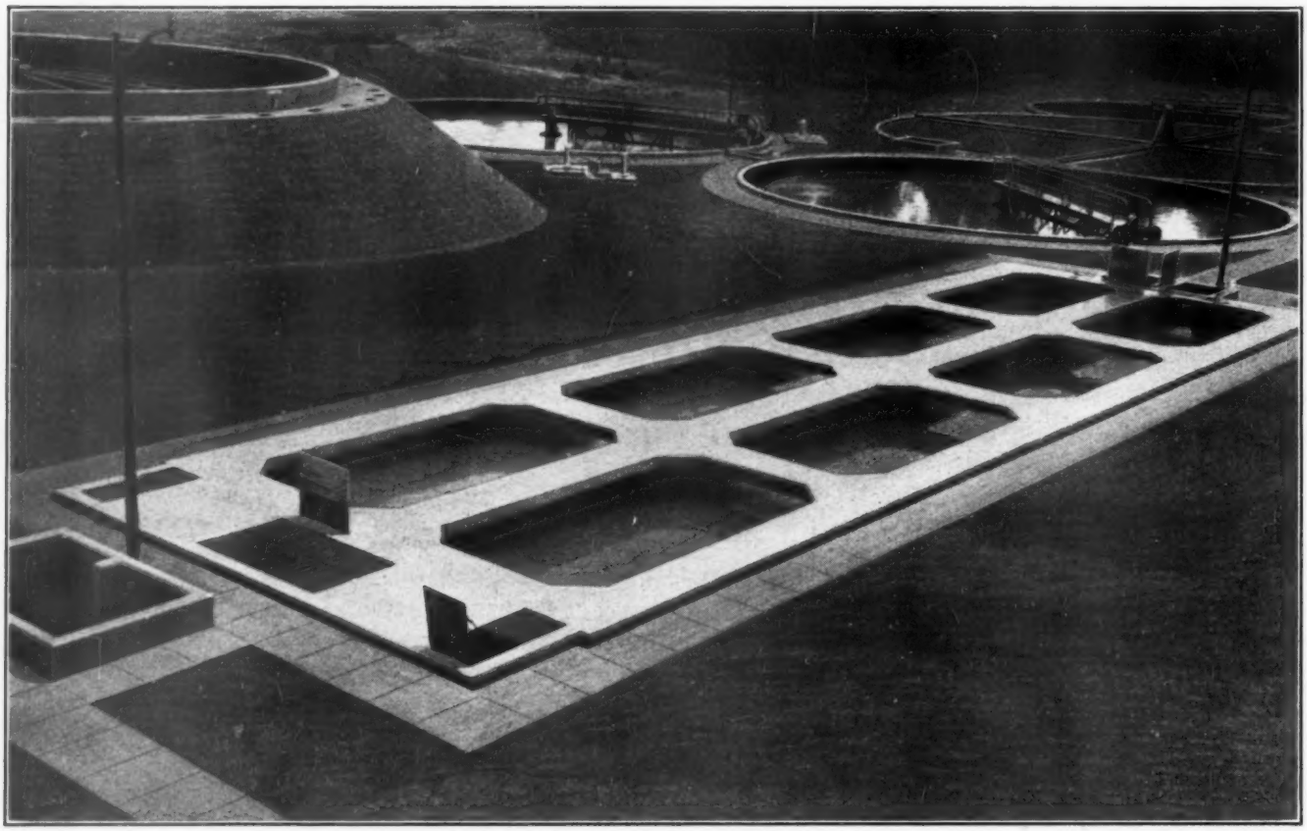


Diagrammatic Picturization of Cathodic Protection as Applied to Sludge Digesters

Sketch reveals arrangement of sacrificial iron electrodes from which D.C. current flows to exposed metal parts requiring protection at spots where original protective coating may have failed.

Elutriation

Elutriation is rapidly gaining favor as a means of improving the ease and economy of dewatering digested sludge. Reliable figures on direct dewatering and incineration of raw sludge as compared with digested sludge, may be forthcoming soon from the new Detroit Sewage Treatment Plant. Such figures will be of value in designing new plants, giving due weight to the value of the



Sewage Treatment Plant of Fort Bragg, N. C.
(Said to Be Largest Biofiltration Plant for Largest Camp)

In foreground are two Flocculation Tanks equipped with Link-Belt Paddle Mixers followed by two "circuline" primary settling units, the "Biofilter" and final clarifiers. Floating-Cover Sludge Digester in upper left.

gas recovered in sludge digestion when considering the elimination of digesters.

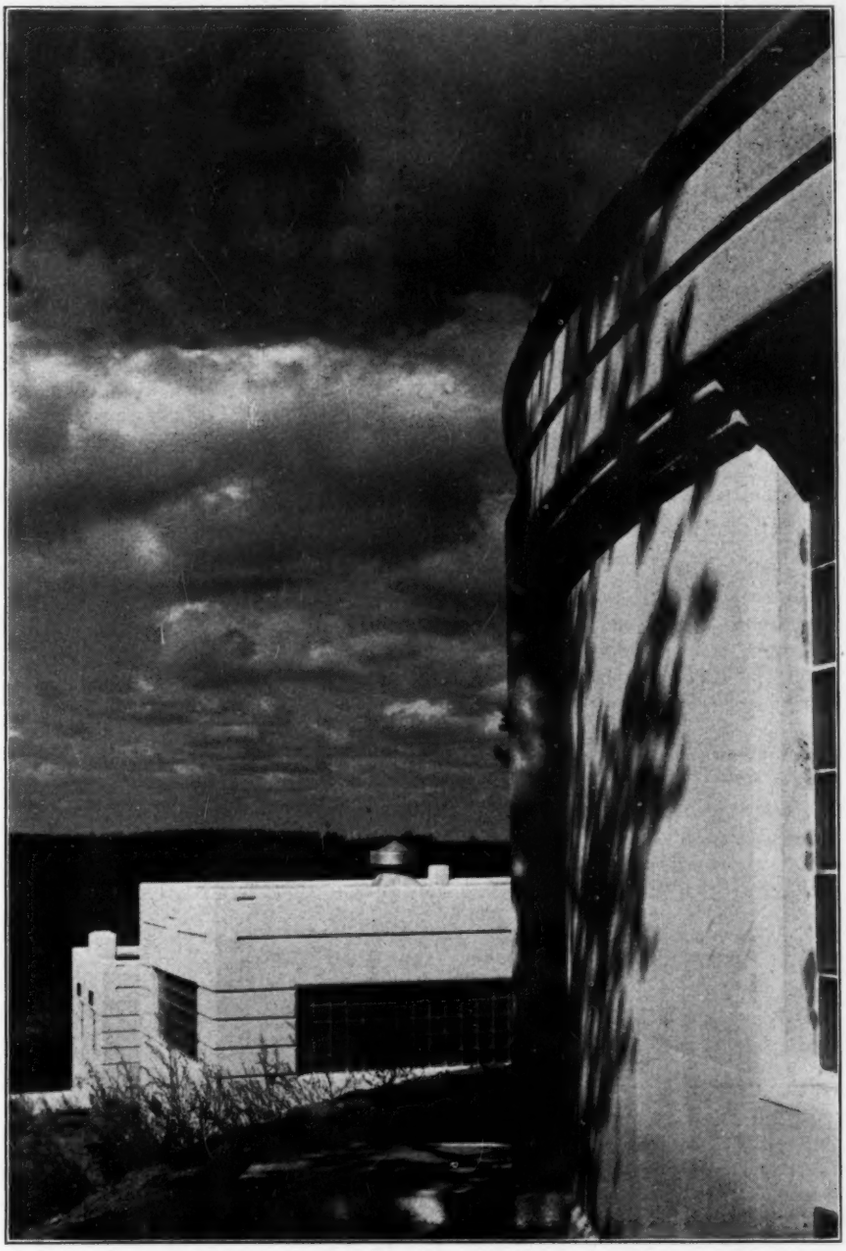
High Capacity Filters

High capacity trickling filters have been given much study, especially, as already noted, for sewage treatment in connection with cantonments. Operating data on routine plant performance are still meager. At Austin, Minnesota, high capacity filters are used as a step in the process of treating a strong sewage containing packing house wastes as a dominating characteristic. Some typical figures on operation at this plant may be of interest.

Loading of B. O. D. per acre foot of filter averaged about 12,000 lbs. per day which is extremely high. B. O. D. removed was from about 4,800 lbs. to about 5,800 lbs. per acre foot.

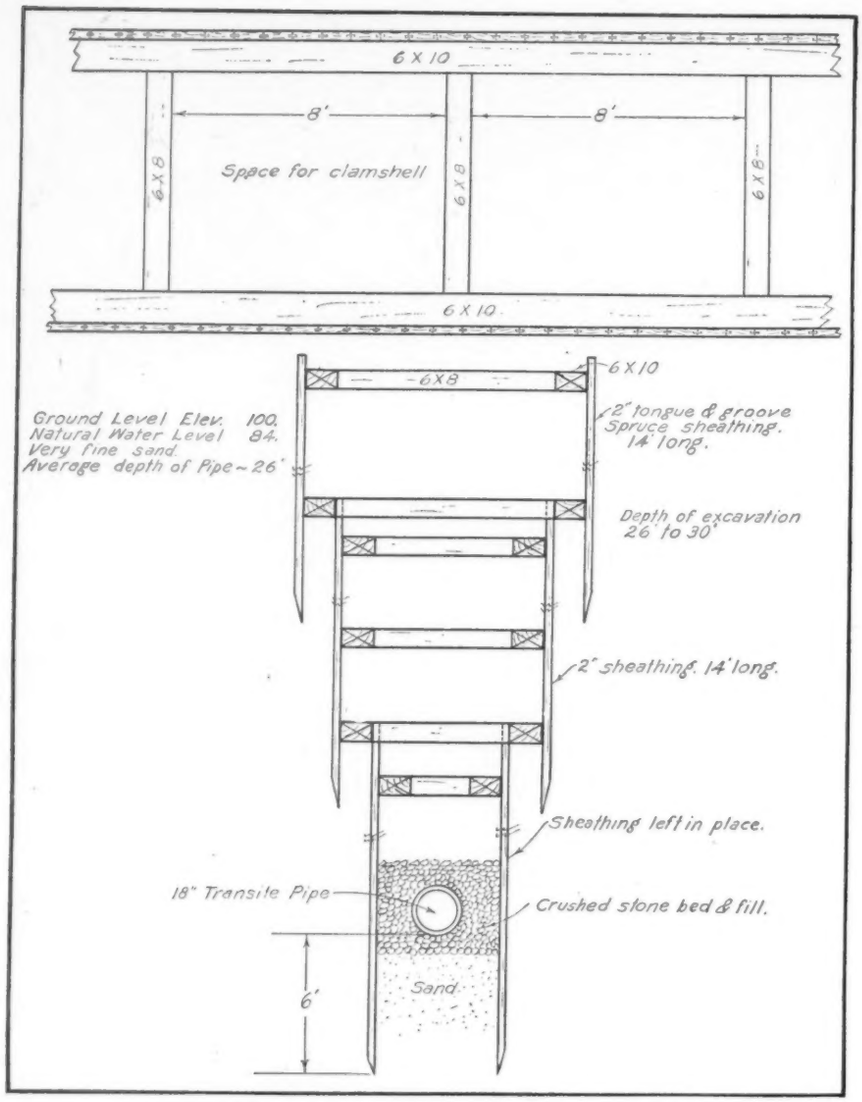
Paints and Coatings

W. T. McClenahan, of the Chicago Sanitary District, has for a number of years studied paints used in and about sewage treatment works and has given an interesting summary of his observations in Sewage Works Journal for September 1941. He points out that theory regarding the scientific preparation of paints for various uses has been advancing greatly in recent years and that many new and remarkable products have been brought out by and for the paint industry. Progress is so rapid that the industry may be said to be in a state of flux. Advance in paint technology is principally attributable to the introduction of tung oil from China, synthetic resins from various laboratories and new types of solvents and thinners. Present wars have produced scarcities of tung oil and other products. War priorities have made demands on zinc, aluminum and other metals and on pigments used in paint. For these reasons it is difficult, even impossible, to write a specification for paint for any desired purpose. Under existing circumstances it is best to specify by performance desired rather than by composition. The performance tests should be simple and applicable to the use intended and in general no test should require more than a month. While pigment adds to the durability of a paint it



The Treatment Plant of Bagley, Minn.
Representing a pleasing and effective adaptation of economical architectural concrete and glass brick construction.

Date	Rate of Application M.G.D. per Acre	B. O. D. parts per million Filter Influent	Filter Effluent	Sedimentation tank Effluent	Per Cent Removal Filters Only	Sed. Tank Only	Total
9-23-41	20.8	406	262	209	35.5	26.4	48.5
	20.8	407	249	213	39	14.5	47.6
9-24-41	21.8	398	272	225	31.6	17.2	43.5
	21.8	385	259	231	32.8	10.8	40.0
9.26-41	20.4	441	262	261	40.6	0.0	40.8
	20.4	448	261	246	41.4	5.7	44.6



Transite Pipe in Deep Sewer Construction

Details of sewer construction in difficult fine sand 24 to 28 ft. depth wherein long lengths of Transite Sewer Pipe were employed to advantage.

is better to test the vehicle only as this tends to speed up the test. For exposed paint on steel used in sewage disposal practice four major tests are recommended, namely:

(1) A cold water test

(2) A hydrogen sulphide test

(3) An ammonia test

(4) An oil-moisture-soap emulsion.

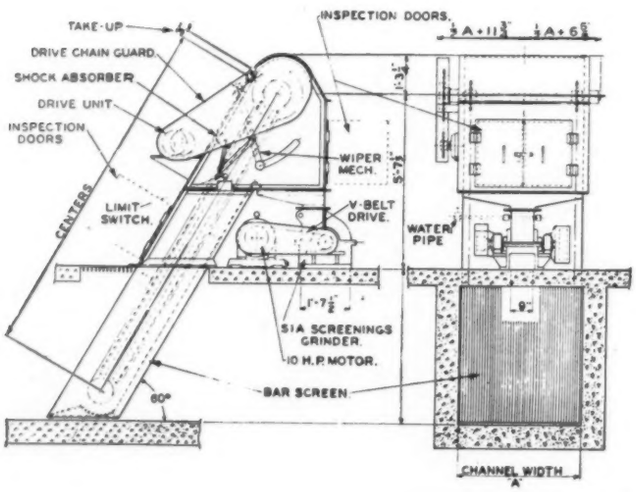
The Sanitary District of Chicago has embodied descriptions of these tests in a manual of standard paints and painting.

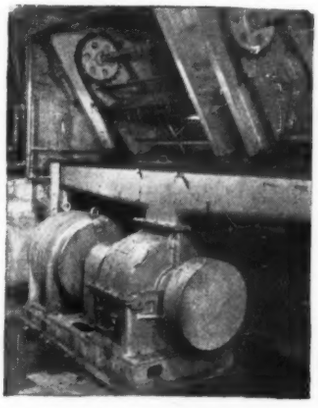
Cathodic Protection

One of the plants of the City of Los Angeles has installed cathodic protection to subdue extensive corrosion of metal parts in sludge digesters. These units were found to be acting as huge wet cells as the result of currents generated through the attack of steel by the corrosive sludge liquor.

Many operators have shown great enterprise and their activity gives indication that important future improvements in the art of sewage treatment are apt to be developed by men who are operating plants or who have had large operating experience.

The successful conventions of the Federation of Sewage Works Associations in Chicago in 1940 and in New York in October 1941 is indicative of the aggressive and active part the operators are taking.





Improved Screens and Grinders

On left is a drawing of Jeffrey's Mechanically Cleaned Screen and Grinder Combination developed for the smaller plants. On right are two large Heavy Duty Jeffrey Screens and Grinders at Hammond, Ind.

WAR-TIME WATER WORKS MAINTENANCE IN BRITAIN*

By A. CARRINGTON WILDSMITH
Northern District Engineer
MANCHESTER CORPORATION
WATER WORKS
MANCHESTER, ENGLAND

UPON the outbreak of war in the autumn of 1939, and in anticipation of possible immediate and heavy air raids on the civil population of Great Britain, water authorities put into action plans for insuring, as far as possible, the continuance of a safe and adequate water supply. Briefly, the problems of the authorities were: (1) to obtain rapid and accurate information of any damage ("incident") to mains and works; (2) to shut off, as soon as possible, any broken mains; (3) to minimize disturbance and loss of working time through loss of pressure or water supply, and to provide drinking water; and (4) to repair the damage. These problems will be discussed in the following pages.

In Great Britain, the general A.R.P. Service, under the control of the town clerk or other authority, establishes in each area a Central Control. At this center all reports concerning air raid incidents are received and sorted. Messages are sent in by police, air raid wardens, etc., reporting incidents on their patrols. A representative of the water authority attends at the center, or the water authority maintains a control center for its own use, and incidents concerning it are passed on from the Central Control. In many authorities the distribution section has been the "Cinderella" of the service, but as heavy bombing is invariably on the cities and not on the outlying headworks, the distribution staff becomes vitally important. It follows, therefore, that its members should figure prominently in the control arrangements.

The Control Room

In the control room itself there should be complete plans of all the mains in the area (skeleton plans are good enough), with sizes and valve positions prominently marked, together with "key" firms; charts of names and addresses and telephone numbers of all personnel likely to be needed in any emergency, together with similar data concerning the key men of other adjoining authorities and their control services. The key firms should be informed if any incident affects their supply. Generally telephones have been used for sending reports, with messengers as a standby. Telephone services have proved more reliable than was expected and the provision of lines out, via different exchanges, reduces the hazard.

The reports state the exact position of the incident, time of origin, whether inside or outside premises, other services affected and obstructions. Provision is made for indicating the presence of war gas (not used thus far). Messages should be passed to Central Control as quickly as possible. The great weakness of control systems is the sometimes unaccountable delay in the transmission. A warden cannot usually tell a severe break on a small main from a small fracture on the large one, yet the difference to the authority is serious. In other cases the damage done by the escaping water from a large main can be more than that resulting from the bomb explosion itself and there have been instances where large volumes of water have penetrated basement shelters, to the peril of the occupants trapped therein. It is not realized by the layman that it takes considerable time to operate the several valves that govern large mains of 24 inches or more in diameter and that water is escaping for considerably longer than the transmission time for messages.

Outside Staff

Messages sent out will be in the first case to district inspectors or turncocks. Most authorities in Britain have found it necessary to increase these staffs.

Extra men have been engaged and given intensive instruction, some authorities providing them with motor transport. One authority considers that bicycles provide the best means of transport if the district is kept small, from, say, half a square mile in the city to two square miles in outer suburbs. The men are usually allowed to stand by in air raid shelters at their homes, the shelters having telephone extensions. On receiving a call from the control a turncock goes to the incident. If the main is small, he operates the valves himself and returns home for further duty. At the depot a number of men and a lorry stand by on a regular rota. They are sent out by the control staff on receipt of a message from the turncock that the shut-off is too large for him to manage by himself, or if to the staff it appears from the site of the incident that extra help will be needed. Damage to pumping stations is covered by calling out the pumping engineer and commencing the necessary change-over.

Bombs are usually released in sticks of five or six at a time, and one area may have several incidents while the next is clear. The incidents can then be divided between the two turncocks. Day raiding in force has become hazardous to the enemy and it has been found that daylight incidents can be covered by the ordinary day routine, the special control arrangements operating during blackout hours. In any case, gradual calling up of technicians for the services is reducing the numbers available for control duty.

To minimize the inconvenience due to a shut-off, a key works should arrange for an alternative connection from another main—it will be money well spent. Inconvenience to the general consumer can be reduced by inter-connecting mains wherever possible and fitting control valves at all branches and cross-overs. The town with two or three trunk mains from the reservoirs to the city will be better off than the place with one. Interconnections with adjoining systems should be arranged on a mutual aid basis. Even a small alternative supply is better than none at all and may at least afford drinking water. These inter-connections have proved very useful. Where only a small area is affected, people can usually obtain drinking water from the next street or so, on their own initiative, but larger areas have to be supplied by mobile tanks of up to a thousand gallons capacity. Gen-

*A paper prepared by the author at the request of John H. Murdoch, Jr., President of the Pennsylvania Water Works Association, and here published through the courtesy of Mr. Murdoch.

erally during a raid people are in shelter and little drinking water is used, the first aid services having their own water carriers. The tank system may have to be extended greatly if the only trunk main to a city is severed in many places, as sometimes happens.

No attempt is made to carry out repairs to outside water mains during a night raid. Where lights are allowed they are too dim to be of any use for other than rescue or first aid work. Some services, such as telephones, can work inside portable canopies erected over the joint hole, but with water services this is not possible. A break small enough to be dealt with in this manner can be left till daylight—a big break has too large an area to cover over; furthermore, a clear picture of what has to be done cannot be formed until all reports have come in and been collated. This is done by the control staff, which sends men to the most urgent jobs and prepares a list of the incidents, to be handed to the district engineers concerned for inspection and supervision. The number of incidents dealt with in one night of heavy raiding may be a hundred or more and it will be seen that control work is no sinecure. In the authority with which the author is connected, control is carried out by one engineer with three assistants (usually clerical), and at least one of each team, usually the engineer, is familiar with the whole routine of the distribution section. This system has served efficiently an urban area of about 40 square miles and containing many hundreds of miles of piping up to 44 inches in diameter.

Repairs

There can be no hard and fast rules about repairs to bomb-damaged water mains. They have one thing in common—that when you see each crater containing a jumble of broken pipes, cables and other debris it seems impossible that order can ever come from such chaos. Nevertheless the seemingly hopeless task must be attempted, and quickly too, for the following night may bring another raid with its further crop of incidents. There is not much daylight in winter and night work on repairs has been mostly impracticable, for lights have to be extinguished on receipt of a raid warning. Where this occurs several times in a night, or the period is long, it merely results in wasted time and poor output the following day through loss of sleep.

It is usually difficult to tell the extent of the damage, which may extend well beyond the limits of the crater. The ground wave from the explosion seems to "whip" the main and sometimes causes a series of fractures for perhaps 10 yards or more from the edges of a 25-foot crater. An examination of the apparent limit of the ground disturbances will afford a clue and the author has found that there is often no damage beyond the limits of the surface cracks. There is an exception in the case of parachute mines, which are tubular containers filled with high explosive and weighing up to two tons, with parachutes attached. These mines explode on the surface of the ground, causing a tremendous blast but a very shallow crater. They have made fractures well beyond the limit of the surface cracks.

If the crater is a small one, caused by a light bomb, the main can be permanently repaired, as for an ordinary fracture. Where the crater is large and the damage extensive, the main is cut off and capped on each side of the crater. If the main is fed from both ends it is then left until the City Engineer's Department has cleared up the site, but if it is fed from one end only, the crater must be bridged with a temporary pipe. For domestic property and mains up to 6 inches in diameter, a 1-inch lead pipe is good, while larger sizes are dealt with by affixing steel or asbestos-cement piping with flexible joints of the "Dresser" type. Mains 15 inches or more in diameter can be temporarily repaired with Victaulic or Dresser-coupled steel tapers and pipes of smaller diameter, but, except in the case of very larger craters of great depth, this is definitely not worth while and it is better to complete a permanent repair, supporting the pipes on piers or diverting around the crater. The amount of labor used in putting in the temporary main is little less and the work has still to be done again at a later date. This applies particularly to the largest mains. The author has made use of a petrol-electric mobile crane of three tons capacity and powered by a 10 hp. Ford engine. This can make short runs on its own power but is towed to the job. Due to the electric drives it can handle material with the utmost precision. It was purchased at the beginning of the war and has been worth its weight in gold on these bomb incidents. Referring once more to temporary mains, it may be necessary to cover a whole area and not merely separate incidents. At least one town, unlucky enough to have few control valves and a closely built-up center, suffered so severely that several miles of temporary asbestos and steel piping were laid in the street channels, alongside the curbs, ramps being arranged at the street crossings. Following very heavy raids it is possible to obtain the help of technicians and labor from neighboring authorities, and the military, too, have supplied labor.

Usually there is nothing in a crater to back up timber if it is necessary to trench into the bottom. The sides of a crater in poor ground, waterlogged because of the fracture, continually fall in on the work, and we have had to fill in ground back of the timbers to brace them.

After a heavy raid, when many streets are blocked, traffic routes are in chaos until the police have charted up the through ways, and it is well if all private traffic is banned from the bombed areas. Even the priority label "Repair Party—Water Works" cannot prevent delays in getting men and materials to the incidents; every effort is made, therefore, to get all stores out to the jobs as early as possible and at the same time arrangements are made for bringing in the men at night.

Experiences with Bomb Damages

On occasions very large bombs have been used, fitted with short delay fuses. These bombs have penetrated about 30 feet or more, and sometimes weighing more than a ton, they have caused tremendous underground disturbance and serious fractures in the surface water mains. One of these fell near a water main 26 inches in diameter, breaking several pipes and disturbing nearby joints. A large bomb fell in the center of a road containing water mains 15 inches, 7 inches and 4 inches in diameter, with a 3-inch diameter branch main off the 4-inch line. The explosion caused a crater over 70 ft. across and filled with collapsed houses and road material. The line of the smaller mains was just inside the crater and the 15-inch through the center; there was severe road cracking for some distance on either side. The smaller mains were stopped off at the furthest cracks and the 3-inch main fed by about 30 yards of lead pipe from the nearest 4-inch stopper. The large main was cut at the furthest cracks and tapered to 12 inches in diameter. Special Victaulic jointed steel tapers and pipes down to 6 inches in diameter were laid round the crater. The main was sterilized with sodium hypochlorite and charged. A week later

when the footpath (sidewalk) had been cleared, all three mains were permanently diverted round the crater. The work was hampered by the presence of a delayed action bomb some few yards from the site, which could not be moved till next day and prevented lorries from approaching. The military eventually extracted the fuse and removed the bomb, casually pulling it out of the hole with a lorry and chain. It proved to weigh about 600 pounds and had penetrated 10 ft.

On another occasion a large delayed action bomb was reported alongside a 30-inch water main. It did not explode and when the bomb disposal squad had reached a depth of 20 feet it had not yet been found. Eventually it was found at 27 feet, where it had curved until it was directly beneath the main. It was drawn to the surface and put out of action. This bomb also weighed over 600 pounds. During operations the main had not been shut off owing to its importance, the men standing by at the nearest valves. Bombs are not removed unless absolutely necessary, owing to the danger to the crews; they are usually detonated if the damage is not likely to affect an essential service.

A delayed action bomb weighing over 750 pounds fell alongside a 36-inch cast-iron water main in a heavily concreted main road. The impact tore off the fins of the bomb, which were left on the road surface, while the bomb lodged just below. On excavating, the bomb was found touching the side of the main. The author and his assistant visited the site (under the firm conviction that the bomb was a "dud"). It was of the thin cased type and somewhat dented by its passage through the concrete surface. It certainly looked harmless enough and it was difficult to realize that the greater part of its weight was high explosive. The bomb disposal officer decided that it was too dangerous to move it or to extract the fuse and it was decided to detonate, arranging things so as to cause the least possible damage to the water main. A sandbag wall was built around the opening to protect the buildings but delays on other services held up the job and the event was postponed till next dawn. The main was shut off but left charged over a distance of about a mile, the lower shut-off valves being only 20 yards down from the bomb. At midnight the bomb detonated on its own time fuse! Thanks to the sand bag wall the surrounding property was undamaged, but the main received the full force of the blast and was completely shattered. The two ends of the break were covered in road debris and one end jammed with a piece of concrete 8 inches thick and about 3 square yards in area which had gone up in the air and fallen edge up into the pipe. The crater was in sand, turned to running sand by the escaping water, of which there was still a great deal trapped in the upstream length of the main by the pile of debris. Two 500-gpm. pumps were put on to get ride of the water but the strainers were continually clogged by the sand and it was some time before actual clearing could start. A trench had to be timbered and filled in behind the timbers, and the crane used to remove the debris in skips, while men had to be sent down the pipe to bring out the sand and stones which covered the invert for many yards. A piece of the bomb casing was found inside the pipe. One 12-foot pipe length was smashed to small pieces and the two adjoining pipes, into larger fragments. No sewers were broken but sterilization was carried out carefully because of the amount of debris that had been washed down the main.

Sterilization

Since the outbreak of war the Ministry of Health has ordered the sterilization of all drinking water, and owing to its cheapness and ease of application, chlorination is practically universal. The method varies, some authorities working on the least possible dose to give a residual following the standard contact period, others maintaining a measurable residual in any part of the system, risking taste troubles in the interests of security. It has been found that once people have realized the value of the precautions they will tolerate some taste. Additionally, some authorities increase the dosage when enemy action develops. This precaution proved extremely valuable in the case of one town on a river estuary. A heavy fire raid developed and the fire brigade ran a supply from the river, relayed through several sets of mobile pumps to the town. The driver of the second set of pumps, having a spare inlet on his pump, connected it to a nearby hydrant. The pump pressure overcame that in the mains and river water was pumped into the main. The control received a message that the drinking water tasted salty. The chlorine dose was immediately increased still further and the engineering staff went over the whole of the brigade piping to find the cause. Despite the fact that the river water was fouled with trade wastes and sewage the high chlorine residual prevented any ill effect.

The sterilization of bomb-damaged mains presents some problems. Small mains are easily dealt with by inserting an appropriate amount of bleaching powder into the pipes before jointing, or pumping hypochlorite through a hydrant with a hand force-pump, while charging the main, 40 to 60 ppm. being a usual dose. After a suitable period the main is flushed through the hydrants and put into use. Larger mains are more difficult—because of their importance they should be in service as soon as possible, yet thorough sterilizing is necessary and the emptying, flushing and subsequent recharging takes time and runs off huge quantities of water from reservoirs possibly already lowered by losses through breaks and fires. Mobile chlorinators are in common use, but the author does not consider their use on rush jobs worth while. To dose a mile of 30-inch main to 60 ppm. will take about seven hours through a plant delivering 350 lb. a day of chlorine, with an injector pressure of 100 to 120 psi. Under most conditions this would necessitate the use of a pump, for which about 10,000 gallons of suction water will have to be provided, apart from the insertion of delivery cocks into the main. The author's opinion is that the easiest and quickest way is to use hypochlorite solution or bleaching powder in all circumstances, keeping the chlorine plants for use as continuous chlorinators in an emergency. The hypochlorite can be pumped in as for smaller mains, or poured down hydrants en route, before charging; the bleaching powder can be mixed to a cream and poured down hydrants or inserted before jointing, as much of the pipe as possible being "whitewashed" with the cream. The author has not heard of a case where bad results have followed the above procedure and the London Metropolitan Water Board recently made a statement that there had not been a single case of water-borne infection following air raids, in the area controlled by the Board. One point is most important—that is the removal of the sediment from the pipe invert. This may be soaked in sewage and, if left, forms a hard layer through which the sterilizing agent cannot pass. The water might then show a good residual and perhaps weeks later be in a dangerous bacteriological condition. In one case a large main was broken by two craters

about 100 yards apart, and the sewers were also shattered. Both craters filled with a mixture of water and sewage and had to be pumped out. For many hours the short length of main acted as a bypass to the sewer and when ready for repairs showed a deposit of sand and sewage two inches thick on the pipe invert. This was cleaned out with a drag scraper and winch, and the main chlorinated twice, the chemist being then quite satisfied with the results of his analysis.

Fires

The same methods of maintaining general supplies will prove useful in the case of water for fire fighting. Here the problem is complicated by the large quantities and the pressure required. Damage to the chief fire mains in the high pressure system may mean wholly pumped supplies being used and with the extensive fires resulting from incendiary attack the quantity pumped pulls down the pressure still more. Despite regulations to the contrary, private firms and unskilled fire teams will not hesitate to connect a powerful pump to the nearest available hydrant and hasty operation may result in a broken main. There is little doubt that pressures have been considerably reduced by careless operation. A walk around the area during a heavy fire raid has in the past told its own tale of hundreds of leaking hydrants (the majority of British water works still use the ball type, in a surface box, which is particularly liable to damage), of hydrants plugged open, with pump suction hoses in the open boxes and the "surplus" water running down the gutter, while round the corner the unfortunate user of a standpipe and hose complains bitterly of the lack of mains pressure. The position is now eased by the use of portable canvas dams, in conjunction with steel or concrete tanks at strategic points, from which the pumps can draw their supplies and which may be filled by hose and standpipe, avoiding direct draw-off from the mains and waste of water. These dams hold from 5,000 to 10,000 gallons but to provide against complete failure additional storage tanks have been constructed in sheet piling or reinforced concrete, or of puddle lined excavations in parks and spaces. These hold 150,000 to 250,000 gallons each. Very large reserves are stored in the basements of demolished buildings, which have been lined with a skimming of cement mortar placed by hand or cement-gun. Some of these basements hold 1 mil.gal or more and are connected to each other and the city canals by temporary steel piping fitted with pump unions. These reservoirs are chlorinated at intervals to prevent odor, but no connection is allowed between any static supply of this nature, or its piping, and the street mains. Sprinkler systems connected to domestic mains may not utilize such water but must run an entirely separate system.

These measures will reduce the peak load on the mains, but even so losses will be high. Following a heavy raid, with fire and high explosive bombs, the minimum night flow on one system rose from the normal 40,000 gph. to 150,000 gph. and remained near this figure for several days. The leakages were therefore 110,000 gph. for the district served. Much of this was accounted for by broken hydrants, the remainder by a few sprinkler supplies leaking undetected in demolished buildings and many hundreds of severed lead services to ruined houses.

Sabotage

Probably the vigorous anti-fifth column measures taken by the British Government on the outbreak of war have accounted for the freedom from sabotage on British water works. Nevertheless, it is guarded against by measures which must remain undisclosed. Short of possession of the reservoirs or pumping stations by a substantial invading force, it is probable that little damage could be caused to a water works if proper measures for the detection of unauthorized persons are taken. The weakest point would be the sterilizing plants where these are a necessity and not a refinement, but as these are compact and easily guarded the precautions are obvious. It is very necessary that the whole staff, including any extra night guards, should be familiar with the officials normally visiting the plant. It is very easy for a new watchman, for instance, to be bluffed by a good appearance and authoritative manner on the part of a stranger visiting the works. Even if the visitor is a familiar works figure the check on identity should not be omitted.

Protection of Buildings

The effect of bombing is probably well known to many U.S. Engineers. Surprisingly, the ordinary standard usual in well-built property is capable of considerable resistance to comparatively near misses, particularly if the building is of reinforced brickwork, or has reinforced concrete or steel framing. The usual light incendiary bomb will not penetrate a 2-inch layer of good concrete and if a building has a flat roof of timber, it is probable that such a layer, lightly reinforced, could be put on over the waterproofing without overstressing the beams. Some buildings erected here since the war show a reinforced brick-work wall 14 inches thick, with windows forming a horizontal line about the level of the machinery. The windows are standard heavy steel casements, glazed with wired glass in 12 by 18 inch panes. On a raft foundation, with blast walls protecting the entrances, and a reinforced concrete roof, this design gives complete protection from blast and splinters for bombs of 500 to 750 pounds falling 100 feet away, and even at much closer distances, and lends itself to effective "modern" treatment of the elevation. Sandbagging should be avoided. The bags soon rot and often the disposal of many tons of sand is a real problem.

To close the paper the author would like to say something of the control staff and the control room. To take the least sentimental view, the control is a valuable instrument in the service of the authority. The staff should therefore have at least the same protection as the most important parts of the plant. It is useless to protect the pumping station if the control staff can be wiped out by the lightest bomb. The concentration and nervous strain demanded by control work can be greatly eased if the staff feel that they are well protected, and have a fair degree of comfort. Under such circumstances an over-imaginative person will perform administrative duties with steadiness that would be quite beyond his powers if the protection was inadequate. Unlike outside staffs, the control staff has not the relief of violent physical action.

Finally the author would say that it is the earnest hope of engineers in Britain that our friends in the United States may never experience the trials we have undergone here, despite the grave fact that your country is now at war with the Axis powers, but we can be sure that whatever may be before any of us, there is no problem arising from these conditions that will not be solved by the ingenuity and determination expected of our profession by those whom we serve.

A.W.W.A. BOARD TAKES IMPORTANT ACTIONS

Spends Much Time on War Measures in Plant Operation and Protection

THE annual meeting of the Board of Directors of the American Water Works Association was held at the Hotel Commodore in New York City on January 19th and 20th. For the two full days of considerations and actions 31 of the 33 members of the Board were in attendance, the only Sections not represented being the Pacific Northwest and the new Cuban Section.

President and Vice-President Elect

Abel Wolman, Dr. Eng., Johns Hopkins Univ., Baltimore, Md.

Samuel B. Morris, Dean of Eng., Stanford Univ., Calif.

Morris Chosen for Vice-Presidency

The first order of business was the meeting of the Nominating Committee which consists of all Directors representing the various Sections. This group nominated the following as officers for the year beginning with the close of the 1942 Convention and ending with the close of the 1943 Convention.

For President

Dr. Abel Wolman (Prof. of Sanitary Eng., Johns Hopkins Univ., Baltimore, Md.

For Vice-President

Samuel B. Morris, Dean of Engineering, Stanford University, California.

For Treasurer

W. W. Brush, Editor, "Water-Works Engineering," New York.

These nominations are tantamount to elections, since the A.W.W.A. Constitution specifies that unless others are nominated by the membership at large prior to March 1st, the election of these nominees becomes automatic on that date.

Awards Voted

The Diven Medal, the highest award of the Association, was voted to:

Samuel F. Newkirk, Jr., Sup't of Water at Elizabeth, N. J., for his leadership of the Committee on Meters during the past two years. The completed report made by the committee covering Displacement Type Meters, published in the December 1941 A.W.W.A. Journal, represents a document of substantial value to the entire water works field. (The Diven Medal goes to "that member performing an outstanding service to the Association.")

The coveted Goodell Prize, which is awarded annually to the author of the most meritorious paper printed in the Journal of the Association during the year, was voted to:

R. F. Goudey, Sanitary Engineer and Director of Water Purification, Dep't of Water and Power of Los Angeles, for his paper printed in the March 1941 issue of the Journal of A.W.W.A.—*"The Practical Aspects of Cross-Connections, Interconnections and Back-Flow Protection."* In this paper the author has presented a valuable discussion of a matter of primary concern to everyone responsible for the delivery of a safe and potable water to the consumer.

Made Honorary Members

Wm. E. Vest, Supt. Water & Sewerage Charlotte, N. C.

Jas. M. Caird, Consulting Chemist, Troy, N. Y.

W. W. De Berard, City Engineer, Chicago, Ill.

Honorary Memberships Conferred

The Board chose three members this year to receive Honorary Memberships at the 1942 Convention. They are:

James M. Caird, a consulting chemist and bacteriologist of Troy, N. Y., a member of the Association since 1900; its Treasurer 1914 to 1921. A pioneer in the purification of public water supplies who contributed much to the attainment of present high standards of quality.

Award Winners

S. F. Newkirk, Jr., Supt. of Water, Elizabeth, N. J.

R. F. Goudey, Dept. Water Power Los Angeles, Calif.

Wilfred W. DeBerard, city engineer of Chicago, a member of the Association since 1912; past chairman of the Illinois Section; for thirty years an active participant in the affairs of the local sections and the General Association and contributing markedly to their success. Member of the Water Works Practice and Publication Committees.

William E. Vest, manager of the Charlotte, North Carolina, water Works; a member of the Association since 1911; Director 1931; Past Chairman, charter member and active in the affairs of the North Carolina section; has rendered outstanding service to his community and been an inspiration toward better water works operation.

Action Taken Regarding Chlorination

Immediately following the declaration of war by this country in December telegrams were sent out from Washington to all State Sanitary Engineers and other public health authorities recommending that the amount of chlorine applied to public water supplies should be sufficient during the emergency to insure the presence of residual chlorine at all points on the distribution system.

The Board in discussing protective and safety measures against sabotage in general gave extended consideration to the above referred to recommendations which would involve a tremendous increase in the demand for chlorine, which is already under the strictest allocation because of war needs, and the practicability of the recommendations as well as the degree of need for attempting to carry residual chlorine into all parts of a distribution system. After much discussion and weighing the question on its merits and justification the following resolution was adopted as a statement of policy which has marked importance to every water utility.

WHEREAS, A recommendation that chlorine residuals be in all cases carried throughout water distribution systems has recently been brought to the attention of the A.W.W.A.

WHEREAS, Experience here and abroad does not indicate that such a general requirement is practicable under many conditions, nor necessary; nor is it adequate protection against sabotage of water distribution systems:

Therefore, be it RESOLVED, That the Board of Directors of the A.W.W.A. express their disapproval of a general requirement that chlorine residuals be carried throughout all water distribution systems; but

WHEREAS, In communities housing defense industries or military encampments, there is greater danger from sabotage or from other type of damage to public water supplies under present conditions than in normal times,

Be it further RESOLVED, That in addition to the usual safeguards for water supply systems, the following protective steps should be assured for supplies furnishing water to communities housing defense industries or military encampments:

(1) Chlorination of surface water sources, except where the existing safeguards *and* historical records of the plant warrant the omission of such treatment;

(2) Chlorination of ground water sources when local conditions indicate the necessity for so doing;

(3) Provision of standby chlorinating equipment as a safeguard against interruption of treatment;

(4) Where chlorination is practiced, maintenance of such chlorine residuals at the point of treatment as are indicated by experience to be adequate, and the making of frequent chlorine residual tests at the point of treatment; and

(5) Provision made for local disinfection in distribution systems when breaks occur or where special hazards exist.

Protection of Water Works Against Sabotage

The Board devoted some time to a discussion involving the guarding of water supply works and other protective measures against sabotage and danger incident to military action. The outcome of these open and free discussions, including experiences of several members during World War No. 1, resulted in the drafting of the following statement as representing the opinion of the Board backed by a special resolution concerning the question of providing guards as a means of increasing the protection of water supply properties.

The statement now already issued by the Executive Secretary of the Association follows:

Protection of water supply works against satobtage is a matter of prime importance. While the overseas record during the present war, as well as in the first world war, discloses few acts of sabotage against water supplies, planning and organization for protection against such form of enemy action must not be neglected. Conditions in the United States and its territorial possessions differ from those existing in Europe and the British Isles. Therefore the situation existing in each region under consideration needs to be reviewed with competent authorities. The protective measures need to be adjusted to the problems that these same competent authorities feel are likely to exist in that particular region or city.

Water works administrators are likely to be held ultimately responsible for the protective measures established. But it should be remembered that the U. S. Army, the Federal Bureau of Investigation, the Office of Civilian Defense and the United States Public Health Service, as well as the various state agencies, maintain an interest in protection of civilian services such as water supply to the degree that the particular civilian service under consideration is related to the field of interest of each federal or state agency.

Although it may be felt highly desirable that water supply executives should be able to look to a single official agency as authority for methods of protecting water service, that is not possible under the present rapidly developing wartime conditions. Experience with real emergency conditions will, without doubt, lead to the designation of a single agency to control such matters.

The extent of protective measures necessary varies with the size of the community and the extent of defense production or military activity in the area served. The small community with no defense activity needs nothing more than good common sense management and operating control. The water supply for communities housing defense industries or serving military centers will need as full protection as a rational consideration of the situation indicates to be necessary.

While no fully authoritative statement of the nature of, or extent of protective measures is now available, there are certain considerations and objectives relating to protection of water services that are quite definite:

1. The loyalty of employees of a water department must be beyond question. A complete personal record of each employee including an officially filed fingerprint record should be developed. This record should include former employees, particularly any recently discharged.

2. All persons employed about water plants should carry identification cards. Such cards should be regularly used.

3. Visiting at water plants or on water department property should be limited to persons who have been furnished a pass—good only for a single occasion.

4. As fully as practicable, critical parts of the water plant should be fenced or barred against entry of unauthorized persons. The doors of all pumping stations, purification plants and similar structures should be locked at all times. Distribution of keys should be restricted to a limited number of trusted employees.

5. Protective lighting should be installed at key points on the property where the other measures do not suffice. It must be remembered that protective lighting will not be functioning when a blackout occurs. Its value as a protective measure, therefore, must not be over-estimated.

6. Spare parts for critical materials and equipment should be stored at a location not affected by the same

hazard as the units to which the spare parts apply.

7. Water Department executives should cooperate with state and local police and state and local police should cooperate with water department executives to the end that critical points in water works systems are known to competent police authority. Attention can be given to such critical points by roving police patrol units and more efficient as well as economical protection be thus achieved.

8. Consideration of the need for special guards about water works property resulted in adoption of the following statement by the American Water Works Association's Board of Directors in a meeting held on January 20, 1942:

WHEREAS, Experience abroad has not indicated the necessity for maintaining an elaborate and costly guard of all water works plants, and

WHEREAS, A careful survey may be necessary to insure the most effective measures of protection within reasonable limits of cost, and

WHEREAS, Guarding of vulnerable points may be effected by permanent guards or roving patrol the efficiency or economy of which only such a survey will show,

Now therefore be it RESOLVED, That it is the recommendation of this Board that each person or body responsible for the operation of a water supply system cause to be made a confidential survey of water works structures under their supervision to ascertain the points of vulnerability so that protective measures both in equipment and personnel can be effected to the extent necessitated by local requirements.

All of the above presumes that the municipality or water company will, as a matter of good management procedure under present wartime conditions, already have provided:

Complete maps of the water system in the control of key trusted employees;

Crews trained for emergency repair of breaks in the distribution system;

An understanding developed with other utilities making the repair services of each available to all when necessary and as practical;

Valves in good working order (as shown by test, not by guess) and in such locations as to control significant sections of the distribution gridiron as well as strategic points in supply lines;

A routine of tests of hydrants which assures their readiness to serve in emergency;

A reasonable inventory of repair material, stored in areas away from point of use, ready for repairs to the supply and distribution system.

Nothing in the above list of things presumed to be already complete, should if yet undone, be undertaken now, if the undertaking involves substantial additions to the property and requires a significant amount of metals such as iron, copper and the like. Protective fencing, barring, lighting, etc. must be undertaken if they are recommended by responsible military or counter-espionage authority.

Water Works Practice Activities

Among the more important decisions of the Board regarding activity of the Committee on Water Works Practice and its many sub-committees were the following:

An agreement to cooperate with American Standards Association Committee A40 in the development of a national standard plumbing code when the American Public Health Association is made a co-sponsor of the project;

Authorization of a new committee on "Recommended Design for Valve Boxes and Covers, Curb Stop Boxes and Covers, and Meter Boxes and Covers";

Authorization of a new committee to develop "Recommended Standards for Threads for Underground Service Line Fittings";

Authorization of the preparation of an official A.W.W.A. statement covering recommended specifications for elevated tank maintenance and painting. This action was taken after the Board had officially noted the fact that some contracts for tank repair had operated to the major disadvantage of the water department because of obscure clauses in the agreement covering replacement of defective rivets.

Other Board Actions

Suspension of Dues of Men in Service

The Board reaffirmed its action taken last year regarding dues of members who enter military service. Such members "may upon written application to Secretary Jordan be carried on the membership rolls and receive all benefits therefrom, without the payment of dues." The request for waiver of dues must be renewed annually so long as the member remains in the service.

Corporate Member Privileges

Administrative officials and employees of water utilities and cities maintaining Corporate Membership in the Association are permitted to register at the Annual Conventions and meetings of the Sections at the lowest registration rate, which is that charged full members. The number of employees permitted to register at the member rate is however limited to five which of course is very liberal.

Growth of the Association

The Association continues its healthy growth, figures revealing an increase from 2,724 membership at the beginning of 1937 to *4,177* members at the end of 1941.

1942 Conference Program, In the Making

At the close of the Board meeting the tentative Technical Program for the 1942 Conference on Water Supply in Chicago June 21-25th (Hotel Stevens) was reviewed by Linn H. Enslow, Chairman of the Publications Committee. While it is somewhat premature to release any exact titles and names, the various topics and the speakers tentatively chosen were reviewed for the benefit of the Board and their comments and suggestions.

It is to be noted that the annual meeting in 1942 is to be termed a Conference on Water Supply, because it is to be more short than is the usual Convention. In the program the keynote throughout is to be Defense, with sessions devoted to such topics as "Management and Operation for the Duration of the Emergency" with leading plant managers and superintendents chosen to present their experiences, plans and procedure. "Protection Against Sabotage Through Property Protection and Water Treatment" is another session topic as will be "Emergency Repairs, Maintenance and Inventory." In the latter matter the Association is making an especial effort to bring to the Chicago Conference some British operator who has gone through "what it takes" during and following air bombardment such as English cities have experienced. This man from the front lines so to speak can give us here invaluable information gained from experience on the "firing line" and no stone will be left unturned in the efforts being made by Secretary Jordan, through diplomatic channels in Washington, to have the best equipped Britisher on hand for the 1942 Conference.

Before the Technical Program can be released for publication, it is evident that the importance of the Chicago Conference to those responsible for water supply during the present emergency can hardly be overemphasized.

THE WHY OF WAUKESHA'S RECORD IN WAR UTILITY OPERATION

By A. P. KURANZ
Superintendent
WAUKESHA WATER DEPARTMENT
WAUKESHA, WISCONSIN

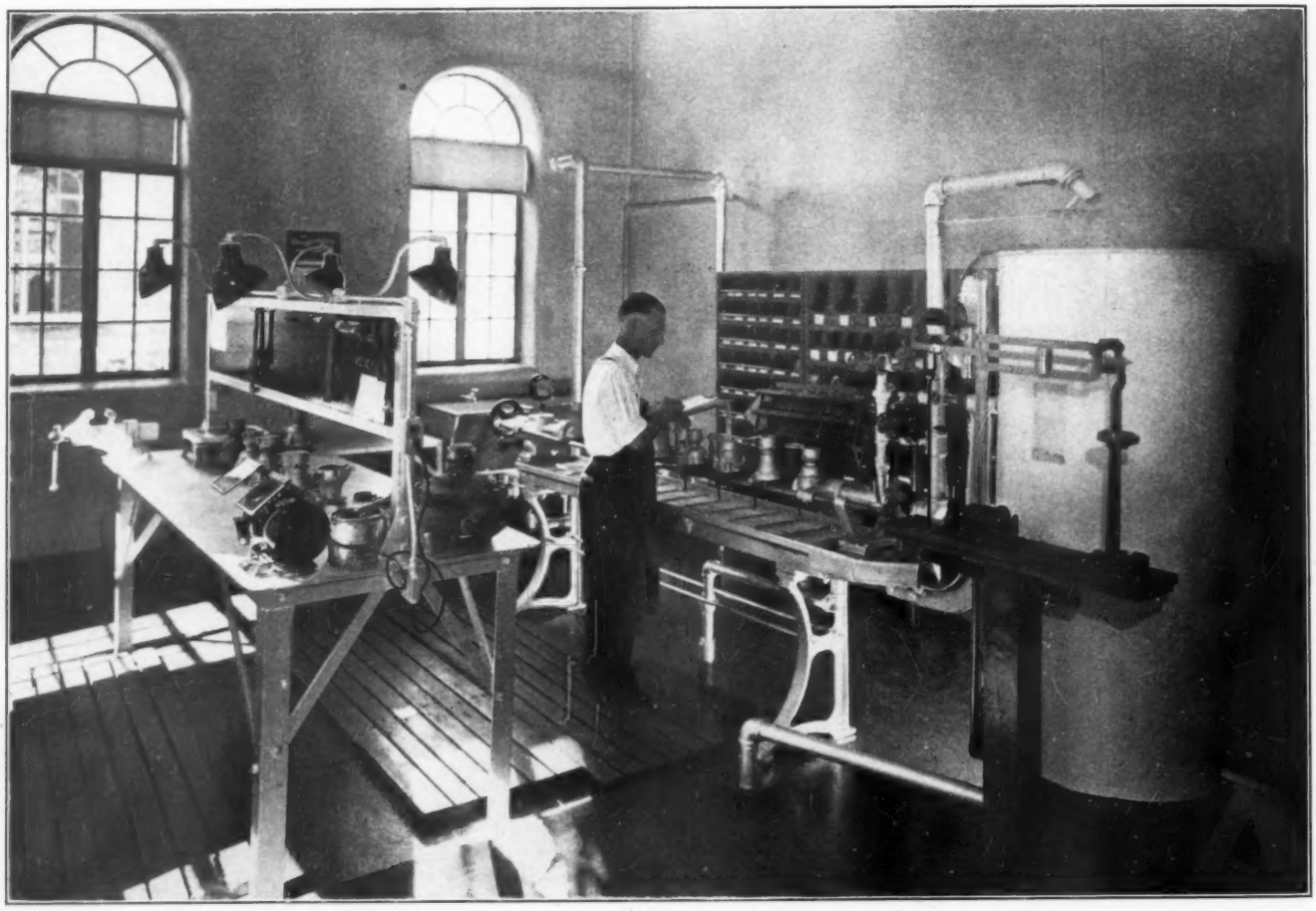
Having noted the highly complimentary editorial comments in the local newspapers concerning the management and financial record of the Waukesha Water Department in recent years and the fact that the Water Utility Commission had been able to pay off debits and reduce the water rate to the lowest in Waukesha's history, led us to request Superintendent Kuranz to tell us how this record had been accomplished. The result is this article. The author who has won for himself a deserved reputation as a most capable manager tells his story with accustomed modesty. He has drawn a picture in tabular form, however, which reveals why Mr. Kuranz was voted the Fuller Award by the Wisconsin Section of A.W.W.A.—"For his outstanding work in developing improved meter testing methods and meter maintenance procedure."

The Author

THE writer has been asked by the editor of WATER WORKS AND SEWERAGE to set forth the reasons why the Waukesha Water Department has been able to show such a financial record as indicated in a statement sent out by the president of our Commission, J. G. Laing, to the larger taxpayers and community leaders of our city? We will attempt to answer.

To begin with a very major reason for such a showing is that Waukesha's water works have been operated without political interference of any sort.

To briefly trace the steps of the accomplishment, it might be well to start with the fact that the Public Service Commission of Wisconsin has control over all utilities, whether privately or municipally owned. This group, while appointed by the Governor, enjoys enough freedom from political interference so that they have been in a position to regulate utilities pretty much on a business basis. With this support and sustaining laws and regulations, the task of running a municipally-owned utility in Wisconsin presents a much easier job than in most other states.

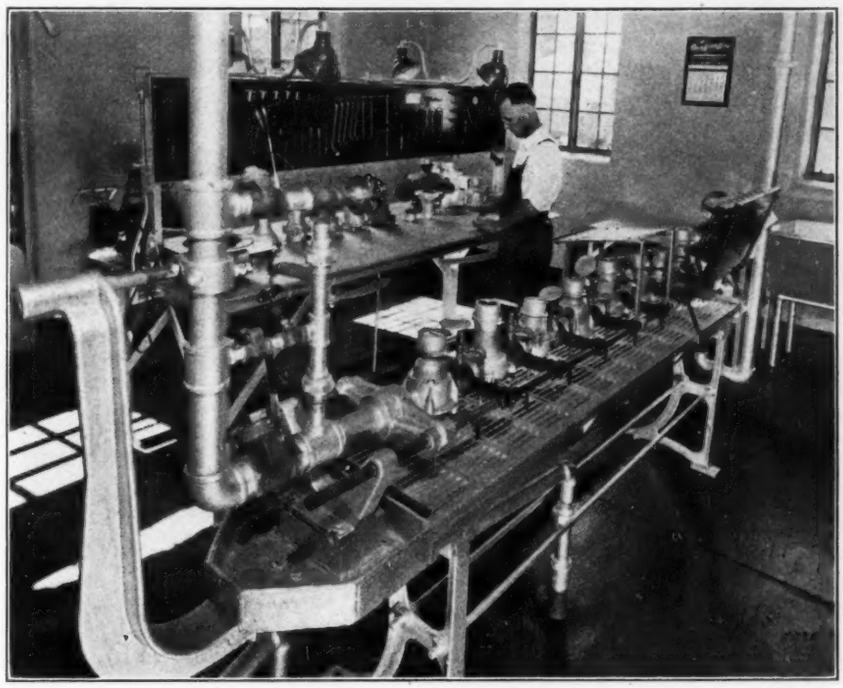


A Portion of Waukesha's Meter Shop

A 28-Year Record That Tells a Story of Its Own and Brought Deserved Comment in Waukesha's Newspapers

Commission Management Responsible

The state law provides that a local utility commission may consist of three, five or seven members, and be elected by the governing body and *not* appointed by the Mayor. These men hold office for as many years between elections as there are Commissioners. In Waukesha's case, the old ordinance of 1907 permitted the Mayor and a Common Council representative to sit on our Commission, and even though a new ordinance was passed just a year ago giving more power to the Utility Commission, we still find the Mayor and the Common Council representative sitting on the local Commission. It is our opinion that these representatives should not be there, but under present conditions they cooperate 100 per cent, and while both the Mayor and Common Council representative are elected by the people of the city and the respective wards, they happily seem to be able to step out of political character. That is to say, as soon as they sit in on the meetings of the Water Commission, they function just exactly as if they were sitting in on the board of directors of an industrial company.



Another View of Waukesha's Meter Shop

A 28-YEAR RECORD THAT TELLS A STORY OF ITS OWN
Waukesha Water Department, Waukesha, Wisconsin (January, 1942)

	Moneys Appropriated by City Through Taxes for		Moneys Used Out of Earnings to Pay for			Moneys Used Out of Earnings to Pay to the City in Cash for		
Year	Bonds	Improvement	Bonds	Interest	Improvement	Taxes	Dividends	City Equity
1914	$ 20,000.00	$ 18,647.14	$	$	$	$	$	$ .....
1915	5,000.00	4,948.80	.....	8,040.00	.....	.....	.....	.....
1916	.....	10,866.02	.....	8,380.00	.....	.....	.....	.....
1917	13,000.00	11,619.39	.....	6,220.00	.....	.....	.....	.....
1918	7,000.00	10,663.40	.....	6,060.00	3,652.01	.....	.....	.....
1919	10,000.00	16,720.65	.....	7,190.00	5,572.62	.....	.....	5,500.00
1920	9,000.00	19,308.77	.....	5,260.00	.....	.....	.....	.....
1921	10,000.00	3,375.79	.....	4,860.00	.....	.....	.....	.....
1922	11,000.00	3,567.55	.....	5,240.00	.....	.....	.....	.....
1923	11,000.00	4,408.63	.....	4,000.00	1,802.81	.....	.....	.....
1924	11,000.00	24,908.43	.....	3,000.00	14,533.75	.....	.....	.....
1925	11,000.00	10,192.89	.....	2,400.00	11,821.58	.....	.....	.....
1926	11,000.00	16,515.76	.....	2,940.00	8,816.57	.....	.....	.....
1927	5,000.00	42,018.17	22,000.00	1,670.00	23,608.50	.....	.....	.....
1928	7,000.00	29,288.38	.....	720.00	31,121.48	.....	.....	.....
1929	8,000.00	33,573.22	.....	440.00	72,826.56	.....	.....	.....
1930	2,000.00	23,713.27	3,000.00	2,545.00	15,757.02	.....	.....	.....
Total 1914-30	$151,000.00	$284,336.26	$ 25,000.00	$ 68,965.00	$189,512.90	.....	.....	$ 5,500.00
1931	.....	$ 1,844.61	$ 3,000.00	$ 665.00	$ 19,761.66	$ 8,493.07	$	$ .....
1932	.....	.....	3,000.00	535.00	51,231.95	8,555.18	.....	.....
1933	.....	.....	2,000.00	225.00	9,792.62	21,351.12*	.....	.....
1934	.....	.....	2,000.00	495.00	24,546.65	20,355.12*	.....	.....
1935	.....	.....	2,000.00	225.00	16,343.11	8,830.80	12,950.43	.....
1936	.....	.....	2,000.00	135.00	52,964.74	8,391.90	17,267.23	6,680.87
1937	.....	.....	2,000.00	45.00	16,233.78	9,058.50	16,700.00	25,000.00
1938	.....	.....	.....	.....	19,632.37	11,980.00	15,700.00	15,000.00
1939	.....	.....	.....	.....	30,703.61	11,608.00	15,100.00	10,000.00
1940	.....	.....	.....	.....	17,388.26	11,635.80	15,000.00	15,000.00
1941	.....	.....	.....	.....	12,089.57	11,036.25	14,400.00	10,000.00
Total 1931-41	.....	$ 1,844.61	$16,000.00	$2,325.00	$270,688.32	$131,295.74	$107,117.66	$81,680.87

TOTAL CASH PAID TO CITY (1931-41, inclusive) $320,094.27

NOTE: (*) Includes adjusted back taxes 1923-1930, inclusive ($11,856.12 each year), taking into consideration water bills not paid by City during the same period for water used chiefly by Park Board, Sewer and Street Flushing.

Free Hand to the Superintendent-Manager

This set-up is followed through by the local Commission hiring its manager or superintendent. This individual is given broad powers to hire and fire and establish salaries and wages, with the final approval, of course, of the Commission. This takes any political interference away from the hiring and firing angle and it makes for good organization. Next, the same procedure is followed in the operation itself. It is up to the superintendent to run the utility just the same as if it were his own business.

The Water Department handles its own money in every respect, from the time that water bills are collected until bills for materials, supplies, and services are paid. The utility pays local taxes the same as any other plant. Since the city, in our case, had invested funds previous to 1930 for the extension and improvements to the water works system, as well as bond retirement, the city has a definite equity in the plant and is surely entitled to dividends on the money so invested. Such dividends have been and are being paid. Any well operated plant tries to reduce its capital investment by retiring bonds, and this plan has been adopted and has been followed through religiously for the last few years. (See accompanying table showing dividends paid the city and bond and equity retirement.)

Operation, Maintenance and Replacement Policy

The superintendent or manager is charged with the operation of the plant in all its respects and, therefore, when he can show the Commission that it is good business to replace an obsolete piece of equipment with a more efficient and better piece, this work is carried out on a purely dollars and cents basis, and if it works out on paper, the change is made. One of the first moves made in this direction back in 1932 was the elimination of the smaller wells and their top-heavy power using equipment. In this way the power bill alone was practically cut in two. For these numerous small, inefficient wells, three large size deep wells were substituted and today the three wells produce water in greater quantities and much more efficiently than did the old system of twelve wells.

Another important step in our improvement program was the elimination of waste in our distribution system. By careful study and subsequent analysis, it was definitely shown that a leak survey would pay for itself in not more than 18 months' time, and on this basis it was a simple task to "sell" the idea to the Commission. Future reports showed definitely that the survey paid for itself between 15 and 16 months' time.

Effective Metering a Major Factor

Since the Commission, and particularly the superintendent, were charged with the efficient operation of the plant, the "cash register" of the Water Department (in other words, the meter) came in for its share of attention and the improvements made during the last seven years indicate definitely that this is one place where the ratio of income to expenditure by our utility was notably improved. The result of the metering improvement program is evident by the fact that although the population increased 7.1 per cent in seven years and the number of meter installations also 7.3 per cent, on the basis of the then existing water rate (a new water rate went into effect January, 1941), the improvement in actual dollars and cents intake climbed gradually to 26.4 per cent. This applies to only one type of customer—residential.

The improvement made in our commercial and industrial customers was also considerable, but since the demand for water in commercial and industrial installations varies greatly with the amount of business done by that particular plant, it is nearly impossible to draw any comparative figures, but our metering program has resulted in selling *and getting paid for* 80.94 per cent of our water pumped for the past eight years.

No Favoritism—a Rigid Rule

There is one detail which is adhered to religiously and which, in our mind, has much to do with the non-political interference, and that is the requirement of prompt payment of water bills. The Public Service Commission, as well as the local utility Commission's rules, provide that water bills shall be paid by the 15th of the month, and that those paid after that date must carry a 10 per cent penalty. If the bill is not paid by the 20th of the current month, shut-off is made and a $1 turn on charge is added. This rule is enforced very rigidly. No one, from the Mayor to the president of the Commission, and even including the superintendent himself, is exempt from this provision. We had one Mayor who repeatedly was late and who regularly paid the penalty until he finally realized that we really meant to collect that penalty. The same thing applied to the president of our Commission several times, and even the superintendent once carried the water bill (with check attached) in his pocket too long and had to take some of his own "medicine."

It has been a task to impress upon our people the fairness of this stand, and each month we find a diminishing number of those who feel that they are some privileged character. While we do not expect to eliminate it completely, the number is being reduced constantly. We do not get a telephone call from the Mayor or aldermen, or the president of the Commission, asking for any special privileges to such-and-such a friend of his. They (the people) have come to learn that it won't do any good.

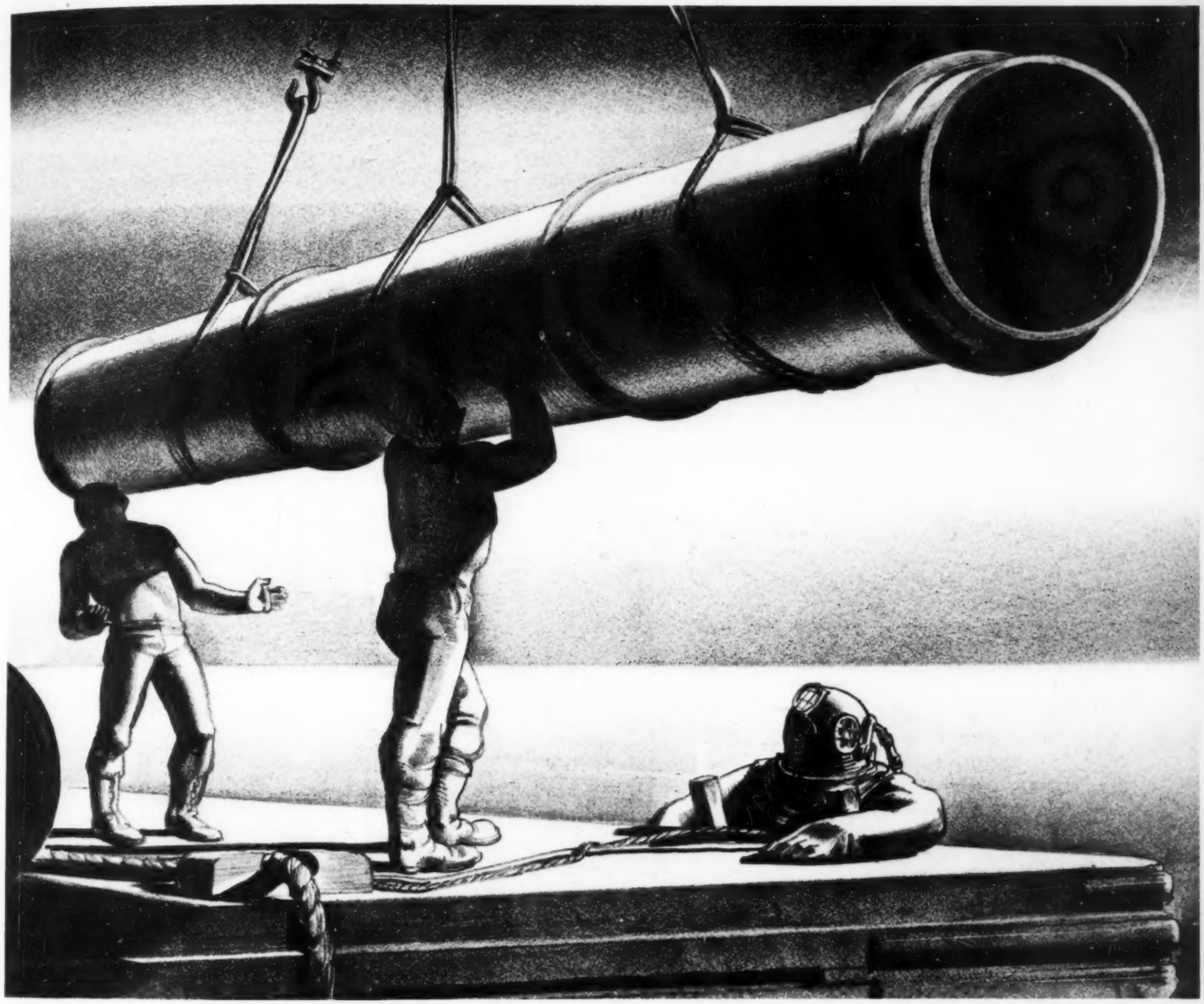
This briefly outlines the highlights in the improvements made in the Waukesha Water Department during the last ten years, and the answer is, as was given in the second paragraph of this story, "Our utility has been operated without any political interference."

WAUKESHA WATER DEPARTMENT
WAUKESHA, WISCONSIN

A Study of Population and Consumption Increases vs.

	POPULATION		——METERS——		WATER MEASURED		VALUE OF SALES		
Year	Census Count	% increase over 1935	Number of residential meters only	% increase over 1935	Gallons sold through meters	% increase over 1935	Dollar value of sales	% increase over 1935	Rainfall in inches
1935	18,208	....	3,655	....	122,765,900	.....	$40,114.85	.....	28.50
1940	19,242	5.7%	3,854	5.5%	153,602,500	25.1%	47,288.93	17.9%	33.54
1941	19,500	7.1%	3,921	7.3%	165,679,500	35.0%	44,536.00	11.0%*	30.05
1941	19,500	7.1%	3,921	7.3%	165,679,500	35.0%	50,700.00	26.4%**	30.05

*On new reduced 1941 rate—lowest in history of the city.
**Increased income if water rate had not been reduced in 1941.

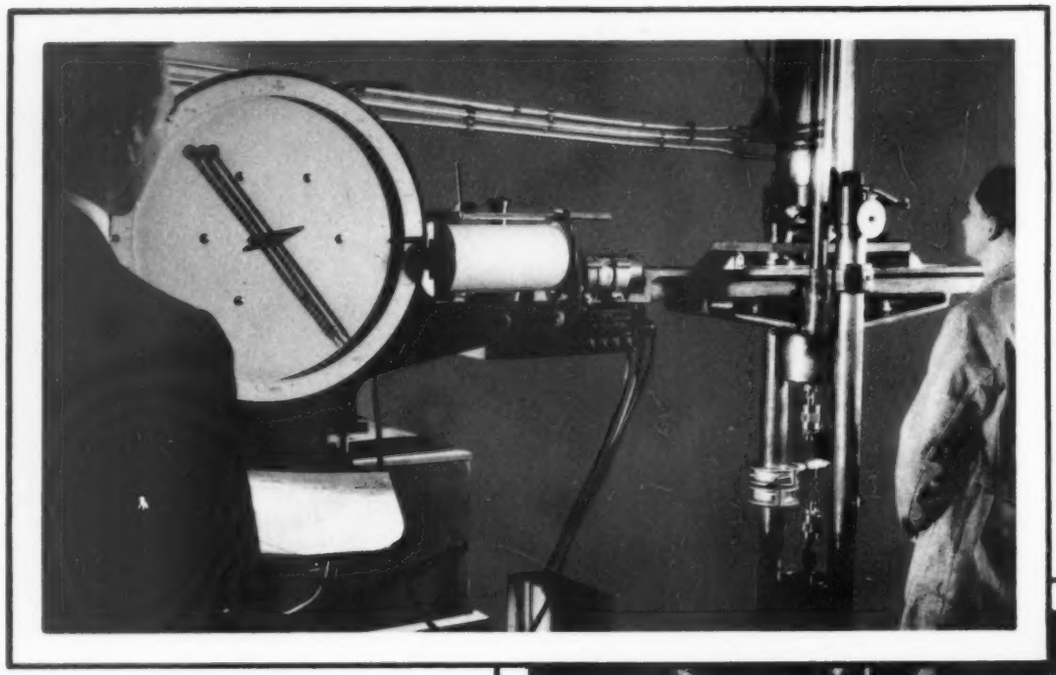


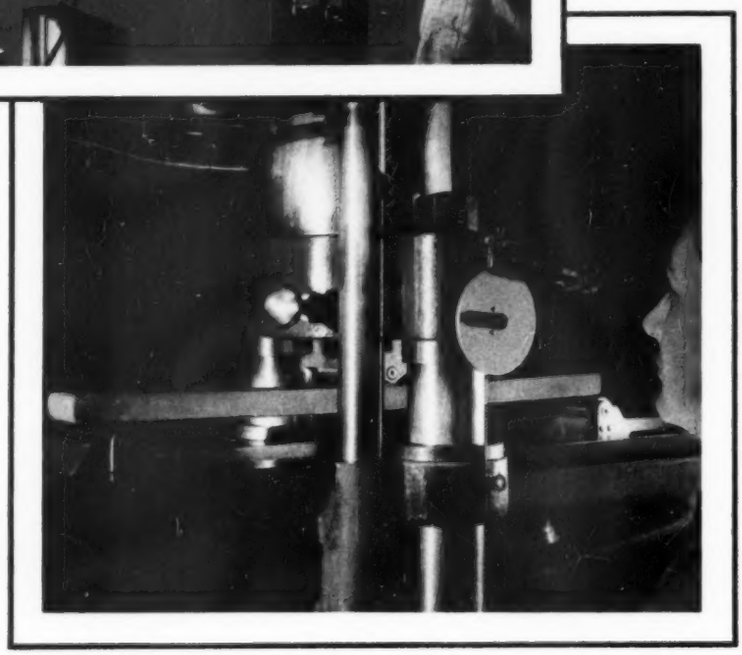
LITHOGRAPHED ON STONE BY ROCKWELL KENT

UNITED STATES PIPE AND FOUNDRY COMPANY

BURLINGTON, NEW JERSEY

America's Largest Producer of Cast Iron Pipe for Water, Gas, Sewerage, Drainage and Industrial Service





* The "2-inch by 1-inch Test Bar Test," illustrated above, is an acceptance test for cast iron pipe. The breaking load and deflection of the bar, which indicate the physical characteristics of the metal, are determined from this test. It is one of the routine tests made by this Company to insure that the quality of its pipe meets or exceeds the requirements of accepted standard specifications for cast iron pipe.

*** One of a series of controls in operation at each of our plants, beginning with inspection and analysis of raw materials and ending with tests of the finished product, all subject to the central control of our headquarters staff at Burlington.**

U.S.
cast iron
PIPE

Centrifugally or Pit Cast for water, gas, sewerage, drainage and industrial services.

NEW YORK STATE SEWAGE WORKS ASSOCIATION

Meets for 14th Year in New York City Contiguously With ASCE Annual Meeting

By HARRY A. FABER*
Associate Editor

WITH an attendance of 235 and with a full program, the 14th Annual Meeting of the New York State Sewage Works Association, now composed of five active local sections, was held in New York City on January 23rd and 24th. The dates of this meeting are selected to follow sessions of the sanitary engineering divisions of the A.S.M.E. and A.S.C.E., so that association members may conveniently attend a number of additional technical gatherings.

Presidents

H. H. Wagenhals, State Dept. of Health, Syracuse (Retiring)

Charles R. Velzy, Supt., Sewage Treatment Works, Buffalo (Incoming)

At the annual business meeting, it was announced that a total of 106 new members were added during the year to make a total membership of 747 in the face of increased dues and dropping of the Associate Member grade. Such healthy growth is especially encouraging, since over half of the new members are managers and operators of plants. In recognition of their long service to the field of sanitation, the Executive Committee conferred honorary membership upon Professor H. N. Ogden, Ithaca, N. Y., and G. Edward Hill, Orange, N. J.; both were charter members of the Association.

Committee Reports

The Legislation Committee (Robert Wheeler, Chairman) reported on two bills now before the U. S. Congress: one being a Public Works Reserve Bill (S-1617) and the other containing all the provisions of the old Barkley-Vincent Bill (HR-5657) which failed of passage due to the imminence of war and the fears of Congress that this legislation might slow up industrial expansion needed to hasten war preparations. Members voted approval of resolutions recommending the adoption of these two bills by Congress at the earliest permissible date.

Impact of National Defense upon the association's committees was evident in action taken to suspend activity of the Public Relations Committee for the duration. This step appeared desirable since most sewage treatment works, like water purification plants, are now restricting visitors. Development of public interest in plants which cannot be visited is considered to serve no useful purpose at the present time. In place of this committee, a more timely one has been designated: the Civilian Defense Coordinating Committee, under William Raisch, New York City, as chairman. Members of the new committee are: Earl Devendorf, Albany; W. F. Welsch, Nassau County; W. W. Watkins, Oneonta; Glenn Searls, Rochester, and J. W. Johnson, Buffalo. Those selected already hold positions in civilian defense activities and provide good geographic representation in the State.

Dr. George Symons, Chairman of the Research Committee, reported lack of operator cooperation in submitting problems for study, even after repeated offers of assistance had been made. On this score the chairman questioned the desirability of continuing the committee. The Executive Committee, however, decided that the chairman should be continued, with power to name his own committee and to study sewage problems which are considered most important.

Dinner Guests

Commander Robt. Cobb, British Royal Navy (The High Seas is His Address)

Major E. B. Block, Cons. Engineer, Kansas City, Mo. (President A.S.C.E.)

Officers for 1942

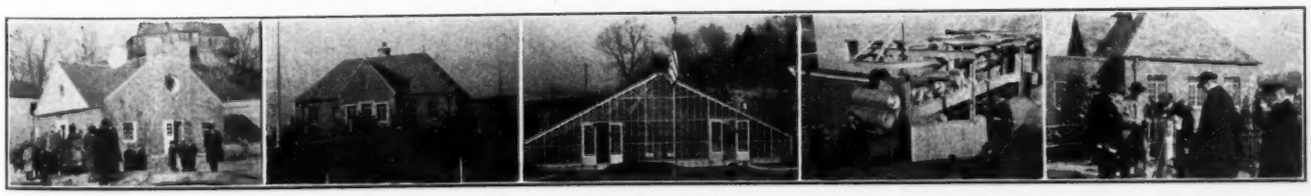
The following were declared elected as new officers or reappointed by the Executive Committee to serve during 1942:

President

Charles R. Velzy, Works Supt., Buffalo Sewer Authority, Buffalo.

Vice-President

Lawrence L. Luther, Commissioner of Sanitation, Freeport.



Plants Inspected

North Tarrytown's Plant. *Tarrytown's Plant.* *Sludge Drying Beds at Ossining* *Chlorine Handling Equipment, Ossining* *Again at Tarrytown's Plant.*

*Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

Reelected and commended for noteworthy service were: Secretary-Treasurer, Arthur S. Bedell; Assistant Treasurer, J. C. Brigham; and Assistant Secretary, A. W. Eustance, all of the State Dept. of Health, Albany.

Three members were elected to serve for a term of three years on the Executive Committee:

Edward J. Smith, Supt., Sewage Treatment,
Niagara Falls.
William H. Larkin, Dist. San. Engr.,
State Dept. of Health, New York.
William D. Denise, Supt., Sewage Treatment,
Town of Greece, Rochester.

Geo. T. Seabury, Executive Secy., A.S.C.E. (A dinner guest; came to say some nice things.)

Clinton A. Decker, Sanitary Engr., Birmingham, Ala. (Presided at dinner for Arthur D. Weston, prevented by illness.)

Awards

The Kenneth Allen Memorial Award, for the most meritorious paper of the year, was presented by Fred Biele, Huntington, Chairman of the Committee, to Professor Gordon M. Fair, Harvard Graduate School of Engineering, Cambridge, Mass. His paper, "The Natural Purification of River Muds and Pollutional Sediments," was presented before the Association and published in the Sewage Works Journal, with Edward W. Moore and Harold A. Thomas, Jr., as co-authors.

In accepting the award, Professor Fair gave full credit to Messrs. Moore and Thomas, who, he claimed, had well earned their share in the plaque with him. He expressed particular pleasure in receiving the award because of his acquaintance, as a young engineer, with Kenneth Allen. Other pioneers in sanitation were active in those days, too, and his contacts with them made an interesting commentary on modern accomplishments.

Retiring President Herbert H. Wagenhals, District Engineer, State Dept. of Health, Syracuse, N. Y., was presented with the Association's distinctive Past President's Key, worn only by past presidents. C. G. Anderson, Rockville Centre, in making the presentation as the immediate past president, expressed appreciation for the contribution of time and effort the retiring president had made to the Association.

The Federation

Speaking as president of the National Sewage Works Federation, Arthur S. Bedell described the importance of this organization. With its 3,000 members, 23 associated U. S. groups,* 1 Canadian and 3 foreign, the Federation is a powerful educational force. He called attention to the special section of Sewage Works Journal now devoted to articles and material of special interest to plant operators, and asked for contributions to the extension of this section.

Morris Cohn, Chairman of the Publicity Committee, urged every member who can to attend the third national convention of the Federation. It will be held in the Hotel Statler, Cleveland, October 15, 16 and 17. A program of important papers is being planned and it is believed that Cleveland's strategic location will enable a banner attendance to be reached.

Guest Speaker Hardenberg Makes Recruiting Talk

Colonel W. A. Hardenbergh, Sanitary Corps, U. S. Army, called upon to describe the function of his corps, presented information of timely interest. Acting for the Surgeon General's office (U. S. A.), the Sanitary Corps is delegated with responsibility for health problems of enlisted men. It maintains a staff in Washington, in each camp area, in the air forces, and in those forces going into the field. Some 250 water supplies and the same number of sewer systems are under its supervision. Mosquito control measures were instigated on the first of April in 197 stations and have accounted for a malaria reduction of 60 per cent over that which prevailed amongst soldiers in 1918. The broad problems of rodent control and typhus control must be studied, and eventual preparations must be made for almost any health problem, outside the United States as well as within.

Colonel Hardenbergh stated that a recent request of the Sanitary Corps for an increase of 350 additional men has been granted; the requirements for men now needed are graduation from an engineering college and some sanitary engineering experience thereafter. Applications from qualified men were invited by the Colonel, since sanitary engineers are needed in numbers to keep husky fighters on the firing lines and in the air.

R. G. Tyler, Prof. of Sanitary Eng., Univ. of Washington, Seattle, Wash.

Wm. L. Sylvester, Asst. to Commissioner, Dept. of Public Wks., New York City.

British Commander and President of A.S.C.E. Dinner Speakers

At the Annual Joint Dinner of the Sanitary Engineering Division of A. S. C. E. and the N. Y. S. S. W. A., the incoming president of ASCE, Major E. B. Black, brought the greetings of that Association. Major Black, who served in World War No. 1, is best known as a partner of the engineering firm of Black

[* Since this was written the important and original sewage works association in America has reached a decision to join the Federation, after holding out for the year to observe developments and study the advantages and disadvantages of becoming a Federation Member Association.—Ed.]

Lunch at North Tarrytown

We won't attempt to name them except to say that in the center with feet on the brass are "Three Mustardeers"—"Doc" Symons (Buffalo); George Andersen (Rockville Center) and "Isco's" Paul Hiller (New York). Only two boast mustacios but this picture shows all three to be well "Beerded."

Wm. D. Denise, Supt. Treatment Wks., Greece Township—Rochester, N. Y. (Elected to the Executive Committee)

James C. Harding, Consulting Engr., Mt. Kisco, N. Y. (Designer of Ossining's plants, recently made Director of Public Wks. for Westchester Co.)

O. F. Gerlach, Supt. of Sewerage, Westchester Co., Dept. of Public Wks., White Plains, N. Y.

and Veatch of Kansas City, well known as designers of sewage treatment and water purification plants. Major Black stressed the two present problems which, in his opinion, should be of much concern to the engineering profession. First, to train young engineers for immediate defense needs. Second, to realize that new problems are certain to follow the war. For handling these problems engineers should be trained as leaders.

Also at head table was George T. Seabury, Executive Secretary of ASCE, who was introduced and complimented the Sanitary Engineering Division for its splendid program and prowess in the nature of committee activities and membership interest.

Speaker of the evening was Engineer-Commander Robert Cobb of the British Royal Navy, whose ship is now in a U. S. Navy yard undergoing repairs. With a most unassuming manner, Commander Cobb described numerous engagements with enemy ships and submarines in the present war, and also his experiences under air attack while hastily evacuating fighting forces from the Isle of Crete. His informality completely won the audience, providing an enlightening address distinctly out of the ordinary.

Plant Inspection Trip

Chartered buses were provided to take members and guests on a plant inspection trip during the second day of the meeting, and a luncheon was served to 100 in the Municipal Building of North Tarrytown.

On the trip which required the best part of Saturday, the following relatively new small plants on the Hudson River above New York City were visited. These plants all provided primary treatment and chlorination.

Plant and Superintendent	*Capacity m.g.d.*	*Treating m.g.d.*
North Tarrytown—A. E. Kassay	1.7	0.84
Tarrytown—J. R. Losee	1.5	0.85
Ossining—Duane Byble.	2.0	0.97

Engineers responsible for design and construction of these three up-to-date plants were Wm. Raisch (North Tarrytown), Chas. J. Kupper (Tarrytown), Jas. Harding (Ossining), and all three have something highly credible to boast of in these modern and well operated plants.

Award Winner
Prof. Gordon M. Fair, Harvard Univ. Cambridge, Mass. (Would claim only part.)

New Vice-Pres.
L. L. Luther, Comm. Public Works, Freeport, L. I. (An honor deserved)

[In company with "Duke" (Wellington) Donaldson, New York's Director of Sewage Disposal, Ye Ed did a bit of reminiscing into the past of sewage treatment and visioning the types of thoroughly weed hidden and barbed-wire enclosed small plants which were so prevalent less than two decades ago. In marked contrast, the three "little gems" of plants visited, and the type of operation and maintenance received, was evidence enough that sanitation and good-housekeeping have arrived on the front page of the "Journal of Municipal Progress."—Ed.]

Wm. T. Miller, Supt. of Water, Ossining, N. Y. (When sewage treatment comes his way he will know something first.)

Dr. Gail P. Edwards, Chief Chemist, Bureau of Sewers, Dept. of Public Wks. New York City

L. H. Rice, Engineer, Wm. Raisch, Engrs., N. Y. City. (Pinch-hitting for boss "Bill" Raisch, had charge of the Inspection Tour.)

Technical Papers

"Varied Problems in Design and Construction of Sewers at Lockport, New York"—by W. R. Drury, Consulting Engineer, Shoecraft, Drury and McNamee, Ann Arbor, Mich.

Both an intercepting sewer system and a sewage treatment plant were needed by the city of Lockport. With plants in operation at Buffalo and at Niagara Falls, and with others under construction, this city would shortly have been the only one discharging untreated wastes into the Niagara River. Having a population of 24,000 and several large industries, Lockport had outgrown its inadequate sewer system, lifted manhole covers being a frequent occurrence.

The engineering program involved, first, a survey of the existing sewer system; second, design and construction of sewer extensions and interceptors; third, design and construction of a sewage treatment plant. Under the program developed, a WPA crew under competent engineers located manholes, connections, etc. This data was plotted by the city's engineers, with National Youth Administration assistance, and the completed plan provides data on all sewers as to size, locations, etc. This record, kept up to date, can be used for many years by the City Engineer's office.

H. V. Crawford, "G.E." — Schenectady
J. J. Horgan Ralph Carter Co., N.J.
R. F. Coltart, Link-Belt Co., Phila.

Capt. I. Mendelsohn, U. S. Engineers, Schenectady, N. Y. and H. B. Lippelt, Mech. Engr., Dept. of Public Works, N.Y.C.

Dr. Gail P. Edwards, Dept. of Public Wks., N. Y. City and Wallace & Tiernan's Charlie Wycoff

Charlie Agar, Sr. Engr., N. Y. Dept. of Health, and Mona Cordell, "Chemistress", Ward's Island Treatment Plant, N. Y. City.

C. G. Topping, R. G. Dennis, J. P. Melhope, All being Johns-Manville Sales Engineers.

D. C. Byble, Chief Operator and Q. R. Hume, Asst. Operator, Ossining, N. Y.

Fred Biele (left) Charlie Emerson (right) and Newly-wed Friends being entertained in the McAlpin Lounge

The "Duke" (Wellington Donaldson) explaining something or other to his "Chemistress" (Mona Cordell) at Ossining.

The major part of Lockport is on a high elevation, but a part of the municipality is some 200 feet lower and is bisected by a canal. It was decided to build interceptor sewers largely in tunnels, so that all of the city could be served by gravity flow. Tunnel size was determined by the smallest size of tunnel which can be built by modern construction methods. Located at a depth of 75 to 80 feet, the main tunnel passes under the canal, but is at sufficient height in the lower part of the city so that flows reach the sewage treatment plant without necessity for pumping.

Most of the tunnel is lined with a thin layer of high density concrete placed by a cement-gun. Some portions, in sufficiently good rock formation, are lined only on the bottom, while at special points (under and near the canal) the tunnel has a full concrete lining laid with forms to insure water-tightness. Work was carried on rapidly by maintaining a 24-hour day schedule and blasting the entire tunnel before starting any lining operations. Savings in cost by lining, to various degrees as required, amounted to over $30,000. Since a check after one year of use proved the amount of fallen or spalled rock to be negligible, the saving was justified.

A number of other unusual problems and their solutions included use of an asphalt-asbestos bonded corrugated metal pipe in 20-foot lengths, with sleeve fittings. This proved easy to lay and saved materially in the cost of the project. This pipe, near the treatment plant, carries sewage under a 10-foot head and meets rigid specifications for pressure tests, no leakage being permitted.

Primary sedimentation, separate sludge digestion, and chlorination are provided in the sewage treatment plant, effluent being discharged to a small creek. Dilution water may be drawn from the canal in sufficient amount to secure both a more diluted and oxygen bearing sewage and sufficient sewer flow velocity for prevention of sludge deposits and septicity in the sewers, thus reducing odors and the chlorine demand of the sewage, as well as a higher removal of B.O.D. in the sedimentation and chlorination process.

"Special Sewage Problems at Army Cantonments," by Charles H. Capen, Principal Sanitary and Hydraulic Engineer, Construction Quartermaster's Office, U. S. A,. Zone 2, New York City.

Lieutenant Howard S. Montin, an associate of Mr. Capen, read a prepared paper under this title, and Mr. Capen then showed slides illustrating modern equipment at several camps. Mr. Montin noted that most plants at army camps receive dilute sewage, with unusual peaks in flow during holiday week-ends. Civilian personnel is largely utilized for plant operation but are under civil service restrictions.

Our North Tarrytown Hosts
(Mayor and Entire Board of Water & Sewer Commissioners.)

(1st Row)—The Mayor, H. B. Harring and the President of the Board, E. P. Haynen.
(2nd Row)—Nelson Page; Albert E. Kassay, Supt. Water Works and Sewerage; John F. Carney.
(3rd Row)—Thos. J. Hughes and Maurice J. Levy.

Requirements of various state health departments as to effluent quality are correlated with plant design, but some differences between those of certain states are difficult to reconcile. Most of these requirements are held to be lacking in sufficient flexibility to permit use of the newer treatment methods.

Camp sewage is notoriously high in grease content, but based on observation, recently installed types of larger grease traps appear to show improved efficiency. Sludge storage, digestion, and drying facilities are shortcomings noted at many plants.

Chlorination is much more extensively used in the present camp sewage treatment plants than was true in 1918. A higher degree of disinfection and retardation of decomposition is accomplished. Thereby, chlorination permits the use of less expensive types of plant construction.

In reply to a question, Mr. Capen explained that grease traps are provided for each mess hall, and that they are cleaned weekly or even more often if necessary.

The discussion soon involved matters of sewage plant camouflage, several members pointing out that tanks present surfaces visible at night, which may serve as guides for airplanes even during blackouts.

"The Effect of War on Material Used in Sewage and Sewage Treatment Works Operation and Construction," by William L. Sylvester, Assistant Engineer to the Commissioner, Dept. of Public Works, New York City.

Mr. Sylvester's paper showed evidence of careful evaluation of normal plant operation in terms of our national defense objective. Many project plans have required drastic change since the events of December, 1941, in order that the greater volumes of material may be available for war production. Design changes tend toward conservation, simplification, salvaging, and substitution.

Despite shortages of material, the relative importance of pollution abatement has been given increased impetus. Probably never before has such high recognition been devoted

"Pat" Patterson, Johns-Manville Co., N. Y. City. and Albert E. Kassay, Supt. Water and Sewerage, N. Tarrytown, N. Y.

Geo. D. Carpenter, Supt. Water and Sewage, Ithaca, N. Y. and A. A. Ward, Pres. Bd. of Public Wks. Ithaca.

"Bill" Highberger Mathieson Alkali Works Mt. Vernon, N. Y. and O. F. Gerlach, Supt. Westchester Co. Sewers White Plains, N. Y.

A. W. Eustance, State Dept. of Health (Asst. Secretary of the Association)

N. M. Fuller, Supt. Water & Sewerage, Olean, N. Y. (Holding down Jo Rehler's job for duration)

Morrell Vrooman, Consulting Engineer Gloversville, N. Y.

to the problem as when President Roosevelt noted that pollution abatement measures are urgently needed to safeguard defense work under way in many areas. Importance of water supply and sewage treatment facilities as direct national defense needs can thus be stressed in each community.

It must be recognized, however, that many sewage treatment projects can be deferred without direct injury to community health. To start such projects at this time is poor judgment, if not actually outside the realm of possibility. New York City now has five major treatment plants under construction. Priorities have been given for the Bowery Bay and Harts Island plants; a favorable B-1 rating has been given for the Jamaica Bay and Coney Island extension, since these are important in the operation of two air fields. It is now impossible, however, to even estimate when the 26th Ward plant may be finished.

While capital improvements must wait, there are many needed things that can be carried on and no organizations should be disbanded. It has already been stated by Federal officials that a reservoir of construction projects is needed. A national director of public works reserve projects and regional directors have been appointed. Preparatory studies and surveys of important works should be carried on to provide a long range program of this nature.

A program to study and utilize possible returns from sewage treatment—such as sale of effluent, sludge, grease, gas, etc.—should be considered. Proper legislation may be devoted to adoption of sewer rental charges. Mr. Sylvester concluded that it is now more profitable to apply ingenuity and inventive genius in solving operation and construction problems in sewage treatment rather than to take time in attempting to get a priority when there is reasonable doubt that such is justified.

"Accelerated Re-Aeration," by R. G. Tyler, Professor of Sanitary Engineering, University of Washington, Seattle, Wash.

Professor Tyler raised a most interesting question about which little practical information appears to be available. Citing limited studies he had made, he pointed out the possible advantage of artificially aerating streams or other bodies of water so that a higher sewage load could be imposed upon them. His experiments appear to be restricted to such treatment of waste sulfite liquor, about 100 times as strong (15,000 ppm. B.O.D.) as domestic sewage.

He stated the question as: "What is the relative cost and effectiveness of adding 1 pound of oxygen or of removing 1 pound of B.O.D.?" The method of accelerated stream reaeration proposed would be with the intention of utilizing to a higher degree the proper aerobic flora and

Last But Not Least
Linn H. Enslow, Editor, "W. W. & S." (New Chairman of the Sanitary Engineering Div. of ASCE)
and
"Doc" George E. Symons, Chief Chemist Buffalo Sewerage Authority (Chairman of the Committee on Research and energizing Secy. of the Western Section of N.Y.S.S.W.A.)

fauna normally present under aerobic conditions in streams. Laboratory experiments were said to have shown a possible oxygen absorption of 40 to 50 per cent of that applied in the form of diffused air aeration.

While no data was given as to type of aeration equipment proposed for this purpose, Professor Tyler believed stream re-aeration may be an economically feasible method of solving some pollution problems. He does not propose it as a substitute for existing methods, but as an alternate or supplementary method under certain conditions. He does not claim to have sufficient data as to the amount of air required, but points out that the cost of returning a stream to its useful function may be lower than providing high degree treatment of the sewage.

Extended discussion of this paper indicated favorable reactions, unfavorable reactions, and lack of understanding of the principle proposed. The largest question raised, and admitted by the proponent of the method, was the engineering practicability of providing the air diffusion system in the stream proper and its maintenance.

[It may clarify matters somewhat to know that Professor Tyler had in mind aeration of an estuary in Washington receiving waste sulphite liquors. Over the air diffuser system, as proposed, the tides would back and fill, so that the same water received more than one oxygenation. —Ed.]

Chas. H. Capen, Consulting Engineer, U. S. Engineers, New York City.

A. S. Bedell, Sec'y. of the Ass'n. and President of the Sewage Wks. Federation.

"Water!"

(A Toast)

The following toast is said to have been given by a Colonel from South of the Potomac on some famous occasion.

Regardless of the fact that we cannot be accurate concerning its origin, we are all interested in the subject matter, and for whatever use this bit of oratory may be put on some appropriate occasion, we pass on to you—"Water!"

"Water—the purest and best of all things that God created. I want to say to you that I have seen it glisten in tiny teardrops on the sleeping lids of infants; I have seen it trickle down the blushing cheeks of youth and go in rushing torrents down the wrinkled cheeks of age. I have seen it in tiny dewdrops like polished diamonds when the morning sun burst in resplendent glory o'er the eastern hills. I have seen it in the rushing stream rippling over pebbly bottoms; in the river rushing over precipitous falls to join the mighty Father of Waters, and I have seen it in the mighty ocean on whose broad bosom float the battle fleets of all Nations and the commerce of the world—but, ladies and gentlemen, I want to say to you now, that as a beverage, it's a damned failure."

Sanitary Corps U. S. Army Needs Sanitary Engr. Officers

Eighty First Lieutenants to Be Created

We are advised by Col. W. A. Hardenberg and Captain Jo. J. Gilbert, of the Sanitary Corps., U. S. Army that the Corps is seeking 80 qualified civil or sanitary engineers to be commissioned 1st Lieutenants for the duration and for 6 months thereafter.

Those to be appointed need have had no previous military training. They must have the following professional qualifications and will be commissioned without examination.

(1) At least 4 years' actual experience in sanitary or public health engineering.

(2) Such experience may have been acquired in the employ of city, county, state or federal departments of health; or with some firm supplying equipment or supplies in the water works and sewerage fields; or with a consulting engineering firm, an approved college or university or other agency providing equivalent experience.

(3) Appointees must be competent to assist in or supervise the operation of water and sewage plants or in mosquito and rodent control.

As to educational qualifications—

(1) The applicant must have completed a four-year course, and received a B. S. degree in civil or sanitary engineering from an approved college or university. (If holding an M.S. degree only 2½ years of experience is required for qualification.) Base pay of a 1st lieutenant in the Sanitary Corps (Medical Corps.) is $2,000 per year plus allowances of $40 monthly for rental and $18.00 for subsistence. If the officer is married the rental allowance increases to $60.00 and subsistence to $36.00 per month.

Applicants must be under 37 years of age and pass the physical qualification tests of the Medical Corps. For further information write Lieutenant Colonel J. A. Rogers, Executive Officer, Medical Corps, U. S. A., Washington, D. C. (Office of the Surgeon General, U. S. A.)

Here is an opportunity for 80 needed qualified engineers to get into the service of their country.

Jim Harding Appointed Director of Works for Westchester County

Jas. C. Harding

James C. Harding, Consulting Engineer of Mt. Kisco, N. Y., has recently been appointed Director of Public Works, for Westchester County, N. Y.

Mr. Harding for the past 15 years has been practicing as a consulting engineer on his own, specializing in the water and sewage fields. Before this he was connected with Fuller and McClintock Engineers, and later was associated with Reeves Newsom, for a period.

Mr. Harding, a member of all of the leading engineering associations and societies has been especially active in the Am. Water Works Association as co-chairman of the Association's Committee on Deep Wells and Deep Well Pumps.

Like the appointment of another consulting engineer, N. L. Nussbaumer, to the position of Director of Public Works for Buffalo, N. Y., Mr. Harding was chosen without political backing or seeking the appointment in any way.

The Harding and the Nussbaumer appointments constitute a most encouraging indication of what may happily be a trend in the making of appointments by political bodies in the future.

Strictly Business

By DALE McFEATTERS

"Colonel, can you spare a dime for an old chlorine and copper tubing sales-manager?"

Frank Flood Made M. & E. Partner

Frank L. Flood

Metcalf & Eddy, Engineers of Boston, have announced the admission of Frank L. Flood to the firm.

Mr. Flood graduated from Northeastern University, College of Engineering in 1922, was elected permanent president of his class and later served as president of the Alumni Association. He has also served as special lecturer at Northeastern University.

Mr. Flood was for five years assistant engineer in the Engineering Division of the Massachusetts Department of Public Health prior to 1925. Since that time he has been, first, assistant and, later, senior engineer with Metcalf & Eddy.

Mr. Flood is a member of the Am. Soc. of Civil Engineers, Boston Soc. of Civil Engineers, New England Water Works Assoc. and New England Sewage Works Association.

During the first world war Mr. Flood, served in the United States Army for 27 months, with overseas service.

Other members of the Metcalf & Eddy partnership are—A. L. Fales; F. A. Marston; J. P. Wentworth; H. P. Eddy, Jr.; A. L. Shaw; and E. Sherman Chase.

It Can Happen (Or "An Editor's Nightmare")

In a recent issue of one of Sparling's interesting and folksy *"Metrograms,"* issued monthly, we ran across the item below which comes close home to any editor. In printing "A Correction" this month the item comes especially close home. We are captioning it—

"An Editor's Nightmare"

(From a Kansas Paper)

We wish to apologize for the the manner in which we disgraced the beautiful wedding last week. Through an error of the typesetter we were made to say "the roses were punk." What we should have said was "the noses were pink."

P. S.—If anyone finds any "pink noses" in the correction appearing in this issue please don't take the trouble to tell us—999 others will.

CHLORINE AND CHLORINATION DEVELOPMENTS OF THE MONTH

MEETING in New York City later in January the Board of Directors of A.W.W.A. comprised for the most part of water utility managers and chemists and State Sanitary Engineers, discussed at length and with thoroughness the question of the advisability of chlorinating water supplies to the extent and with the frequency required to assure the presence of residual chlorine throughout most if not all of the distribution system.

This topic was considered a No. 1 subject by the Board, because of the overall effects and the questionable soundness of putting into practice the attempted procedure of maintaining residual chlorine through to consumers' taps. After extended consideration of what the practice would entail in the way of vastly increasing the chlorine requirement from the nation's supply, already under the strictest allocation because of war needs; and, likewise, the demand to be created on restricted metals and rubber to produce the additional chlorination equipment which would be required of already pressed chlorination manufacturers; and, most important, the question of the probable untoward effects on old pipe interiors and resultant water quality, without the scheme being a positive assurance that the public would thereby be safeguarded against a saboteur who *might* attempt injections of bacterial cultures or poisons into the system, the Board went on record—on record with its views that—

(1) The need for maintaining residual chlorine in the distribution system can not be considered other than on its merits for individual systems, and is not justified as a blanket emergency practice.

(2) That there appears no justification for the additional load which such procedure, if widely practiced, would entail on the Nation's restricted supply of chlorine and metals.

By this action, which is given in more detail under heading "A.W.W.A. Board Takes Important Actions" as reported elsewhere in this issue, A.W.W.A. Directors have gone on record as questioning the reasonableness of the proposed practice for water supplies in general and in disapproving the telegrams sent out of Washington at the time war was declared by the U. S., recommending that chlorination practice be such as to insure the maintenance of residual chlorine in the distribution system during the emergency.

Chlorine Now Obtainable Without Filing Forms PD-190

On January 28th O.P.M. (now W.P.B.) issued notice to chlorine manufacturers and all concerned that henceforth orders for chlorine required in water and sewage treatment are to be filled without the earlier requirement that the special Form PD-190 be filled out by the customer and filed during the month in advance of that of required delivery.

This notification, which is reproduced below in full, constitutes a great relief to consumers in the water and sewage fields, as well as to the manufacturers of chlorine who have taken especial pains and precautions to insure the continuity of chlorine supply for water supply protection and sanitation uses. The notification follows—

OFFICE OF PRODUCTION MANAGEMENT
Social Security Building
Washington, D. C.

January 28, 1942.

Gentlemen:

Anything in paragraph (c) (1) of Amendment No. 1 to General Preference Order M-19 to the contrary notwithstanding, you are hereby authorized and directed to accept orders for chlorine from persons who certify that they require such chlorine for use in potable water and sewage treatment whether such orders are accompanied by Form PD-190 or not; and to make deliveries of chlorine under such orders in your usual way.

You are also hereby authorized to make limited stocks (not over a thirty-day supply) of chlorine available to your distributors for fulfilling orders for chlorine for potable water and sewage treatment. Such distributors must prior to delivery of chlorine to them for such purposes certify that the chlorine so delivered will not exceed an estimated thirty-day supply (for such purpose) and will not be distributed for any use other than potable water and sewage treatment.

During the month of February, such orders as may be received by you for delivery in that month may be filled from the unallocated balance of the five per cent of your liquid chlorine production required to be withheld from scheduling for delivery as provided in paragraph (d) (1) of Amendment No. 1 to General Preference Order M-19 or from any other available inventory stocks.

An order is now in preparation which will further clarify the handling of chlorine requirements for potable water and sewage treatment. It is now expected that this Order will be issued shortly.

Yours very truly,
(signed) J. S. KNOWLSON
James S. Knowlson
Director of Industry Operations

The Question of Future Availability of Dry Hypochlorites

Apparently a deal of concern has arisen out in the field over reports which have raised the question of continued availability of the dry high-test hypochlorites in the future, thereby, the question of assured dependence upon the practice of hypochlorination, either as the primary or even the stand-by method of chlorination of water supplies, has been raised by health authorities and others.

This matter was brought to the attention of manufacturers of the high-test hypochlorites and the O.P.M. (now the War Production Board). The latter considered this matter to be of sufficient inportance to release a special statement for publication on January 27th. In the *Journal of Commerce* (Washington) the statement was given front page position and boxed for conspicuity. The W.P.B. statement follows in full.

WAR PRODUCTION BOARD
Division of Materials

Necessary amounts of chlorine for water purification will be provided throughout the nation despite the general chlorine shortage, the Chemicals and Allied Products Branch of the War Production Board announced today.

While chlorine is one of the most widely used chemicals in war manufacture, and many restrictions on civilian use have been necessary, water treatment according to the announcement, will not be one of them. Chlorine in all forms for potable water and sewage treatment is given a high preference over civilian and some war uses. This preference will permit water and sewage plants to obtain necessary supplies of chlorine and sodium hypochlorite.

High test calcium hypochlorite and chloride of lime are at present more scarce than chlorine and sodium hypochlorite. For that reason, the Chemicals and Allied Products Branch says, it may be necessary that those plants which use these materials change to one

of the latter. This will not impair sterilization efficiency, as chlorine, sodium hypochlorite, chloride of lime, and high test calcium hypochlorite can be used interchangeably for these purposes, it is pointed out.

The above statement is as reassuring as it can well be, that water supply is always to be assured high test hypochlorites as long as possible. However, the statement is not without its warning note that it *may* be necessary at some future time for present users of the dry high-test hypochlorites to change to sodium hypochlorite, which is only produced in solution form and is not subject to long storage.

Based on this statement it is well for all present users of the dry high-test hypochlorites to do some planning in advance. That is, they should consider what action to take in case the powdered material becomes temporarily non-available, or orders can not be filled in the specified time of requirement of the material. One of the following may be suggested.

(1) Determine the nearest two sources of sodium hypochlorite solution; also, the strength in available chlorine that can be supplied if and when needed. Such information can best be secured from chlorine manufacturers and also by the makers of hypochlorite feeders.

(2) There are also some producers of calcium hypochlorite in solution form. For the most part these are chlorine manufacturers who ship the solution to a relatively small number of industrial customers in 55 gal. drums. The nearest producer should be determined.

(3) And finally, and probably the most logical move of all, is to request advice from the suppliers of high test hypochlorites as to the procedure recommended for such a potentiality as the non-availability of the dry product at some future time.

Ever since Pearl Harbor we have had impressed upon us the wisdom of being on the alert. While there may never come the day when a water supply will suffer from the scarcity of high-test hypochlorites, it seems prudent to plan in advance what to do in case the dry material can not be procured in ample time to preclude running out. The operator who has this potentiality at heart will have another source of hypochlorite ready for demand call.

Fortunately with the residual chlorine index for dosage control the matter of exactness of available chlorine strength of the substitute hypochlorite is not a matter of so much importance—i.e., so long as the approximate strength is known. The major precaution is to know always in advance where the substitute supply of calcium or sodium hypochlorite can be had with assurance, in case of shortage—for that matter, this information should be available in the files of every hypochlorite user in case of any other emergency.

We do not believe that any hypochlorite user will ever find it necessary to issue boiling notices just because he finds it impossible to secure hypochlorite in some form. It is only a matter of being prepared—of being on the alert.

L. H. Enslow Elected Chairman of Sanitary Engineering Division of A.S.C.E.

R. F. Goudey Becomes New Secretary

At the annual meeting of the Executive Committee of the Sanitary Engineering Division of the American Society of Civil Engineers, Linn H. Enslow was elected Chairman of the Division and the Executive Committee on which he has served for the past four years.

The Committee also elected R. F. Goudey as the new Secretary of the Division and Committee as successor to A. Clinton Decker who becomes Vice-Chairman of the Committee.

Mr. Enslow is Editor of "Water Works and Sewerage" and Advisory Sanitary Engineer to the Chlorine Institute, New York City. Mr. Goudey is Chief Sanitary Engineer in charge of water quality for the Los Angeles Department of Water and Power. Mr. Decker is Sanitary Engineer of the Tennessee Coal, Iron and Ry. Co. of Birmingham, Ala.

The Executive Committee of the Sanitary Engineering Division now consists of Linn H. Enslow, Chairman; A. C. Decker, Vice-Chmn.; R. F. Goudey, Secy. and N. T. Veatch Jr. (Kansas City), and Geo. J. Schroepfer (Minneapolis).

Nussbaumer Now Buffalo's Director of Public Works

N. L. Nussbaumer

Newell L. Nussbaumer, Consulting Engineer of Buffalo, N. Y., has recently been made Director of Public Works for the City of Buffalo, N. Y. The significance of this appointment lies in the fact that the appointee was not seeking the position, and was chosen because of his reputation and ability as an engineer and executive.

Mr. Nussbaumer, a surprisingly young man considering his accomplishments and his selection for the important Buffalo post, was early in his career associated with George L. Diehl, Consulting Engineer of Buffalo. He hung up his own shingle as a practicing sanitary engineer, about 10 years ago and now has many efficient water and sewage plants to his credit. He is a member of all leading technical associations and professional societies and is a past-president of the New York State Sewage Works Association.

Congratulations to you "N. L.," and congratulations too to those Buffalo authorities recognizing ability rather than following political expediency in making the appointment.

New Chemical Formulary

The Chemical Formulary (Vol. V), representing a revision of earlier volumes, contains 700 pages which reveal literally thousands of the latest tested formulae from many important industries.

Whether a chemist, engineer, manufacturer or just a layman, much of interest and value to each is to be found in this hand-book of products formulae and preparations purchased on the market at fancy prices, and many of which can be made up in the cellar or kitchen.

Some of the materials covered by individual sections are Soaps and Cleansers; Polishes; Cosmetics and Drugs; Inks; Lubricants, Oils and Fats; Adhesives; Beverages; Solders; Bleaches; Disinfectants; Metal Treatments and Rustproofing; Boiler Compounds; Dental Products; Fertilizers; Waterproofing and Fireproofing Materials and Processes; Automobile Specialties; Paints and Protective Coatings; Cleaners, etc.

This is a book that may save its owner many dollars in the compounding of materials now purchased at fancy prices.

The price of this 700 page handbook of chemical formulae and tested methods of doing things is $6.00. The publisher is Chemical Publishing Co., Inc., 234 King St., Brooklyn, N. Y.

CENTRIFUGAL PUMP MAINTENANCE*

By VANCE C. LISCHER
Engr. in Charge of Production
ST. LOUIS COUNTY WATER CO.
UNIVERSITY CITY, MO.

THE response to duty of those charged with delivering an adequate and safe water supply to the public must necessarily include a sound policy and technique for the maintenance of all equipment, in addition to the customary provisions for standby. A poor maintenance program overworks standby equipment and will ultimately lead to trouble. A good maintenance program practically eliminates failures. This paper will be limited to a discussion of maintenance problems and methods involved in the care of centrifugal pumps. Prime movers and other types of pumps will not be included. Due to the fact that organization, personnel and maintenance policies and facilities are such important considerations in the successful solution of the problems encountered, a large portion of the discussion will be devoted to these factors. The suggestions made are based on experience in the maintenance of the equipment of the St. Louis County Water Co. and on observations of maintenance procedures of other water works, as reported in the literature of the last ten years.

Regardless of the size of a plant, its maintenance policy must be determined by the potential hazard of failures. In the small system, if a high degree of standby is provided, allowing outages of a unit for several days or a week, the policy may be simply to replace damaged or worn parts. Obviously, only simple tools and relatively unskilled personnel are required in such cases. This policy will, of course, be more general in systems of less than 10 mgd. capacity, unless a consolidation of the repair shops of the water works and of other city departments is practical. Unless a complete set of spare parts is stocked, working agreements with local machine and welding shops are desirable in systems of such small size.

In larger plants a well equipped shop and a thoroughly trained personnel are necessary, since stocking an adequate supply of spare parts is impractical. To permit equipment to lie idle while parts are being ordered is neglectful. The responsibility of furnishing an uninterrupted supply of water is so great that the cost of providing adequate shop facilities is a legitimate charge against the service. Such a shop should be equipped to make a great many of the replacement parts required and to restore worn or damaged parts to useful service.

The Author

This well timed paper deals with practices and procedures of especial interest to water and sewage works operators at this critical time of scarcity of metals and equipment.

The probability that priorities will make the procurement of new and replacement equipment the more difficult, as the world's greatest war progresses to a quicker and more complete victory than otherwise will be possible, makes it doubly important that wherever possible conservation, maintenance and repair practices be of the highest order as one contribution of patriotic water and sewage works operators in attaining the victory which is to be ours.

The author of this splendid article will be remembered by many as winner of the Goodell Prize of the American Water Works Association for his paper, "Water Hammer—the Correction of an Unusual Problem," which was published in the March, 1937, issue of the Journal of A. W. W. A.

From the present paper there is more than usual to be gained at this time by its careful reading and following the author's lead in the placing of more and more emphasis on conservation, rehabilitation, maintenance and repair than has heretofore existed.

Shop Facilities

To make satisfactory repairs, considerable thought must be given to the selection of shop equipment and tools. A liberal policy in equipping the shop with proper tools of good quality will have a beneficial effect on the attitude and work of all employees. The more important equipment of a shop charged with maintaining centrifugal pumps should include:

1. Welding equipment—oxyacetylene and electric arc.
2. Lathes—one capable of swinging the largest impeller assembly is indispensable. A smaller one will also be desirable, if the largest lathe swings 15 in. or more.
3. Shaper or milling machine, or both.
4. Drill press.
5. Power hack-saw.
6. Flame cutting equipment.
7. Micrometers, calipers and gages.
8. Portable electric tools—grinders and drills.
9. Tool post grinder.
10. Stationary grinders.
11. Forcing press.
12. Metal spraying equipment.
13. Sand blasting equipment.
14. Arbor press.
15. Pneumatic tools, chippers, etc.
16. Coupling pullers.

Supplementing these must be a well stocked store and tool room. The investment in a complete stock of machine and stove bolts and nuts, pipe fittings and other miscellaneous hardware will be found helpful in saving labor and time on emergency repairs. The tools in the tool room should be under capable supervision, should be stored on tool boards and should be checked out by means of a tag system. This insures their being available and in good condition at all times.

The physical shop equipment required is a separate problem for each plant and the selection of equipment and the establishment of policy should be determined after a careful analysis of the work to be undertaken.

*A paper presented before the Missouri Valley Section of A.W.W.A. and here reproduced by permission of the Association.

Issued to: Shop Force
Equipment: No. 3 Pump
Location: Stratman Booster Station:

No. S58MSA3
Frequency: Semi-annually
Charge Acct. 753-91

Work to be done:

1. Make general inspection of operation and condition of pump.
2. Remove and clean packing followers.
3. Clean and lubricate follower bolts and nuts.
4. When replacing followers be sure packing is resilient and that the followers fit evenly. Repack if necessary.
5. Check alignment of pump and motor
6. Drain oil from bearings and add new oil.

Date	Report	Signed	Date	Report	Signed

Fig. 1. Maintenance Record Card Used by the St. Louis County Water Co. (Showing face above and a portion of reverse side below)

Personnel

The careful selection and training of the shop force is a very important responsibility of management. Each shop man should be capable of functioning well in a variety of skills as well as being a specialist in one or two. Thus, by diversifying the specialties, a force will be available for any eventuality. Some of the skills necessary for performing maintenance work on centrifugal pumps dependably are:

1. Machine shop ability on the lathe, the shaper and the milling machine.
2. Welding ability by the oxyacetylene and electric arc methods.
3. Flame cutting ability by hand and with the radiograph.
4. Bearing repair ability by babbitt scraping and pouring and by building up babbitt by spraying and welding.
5. Grinding and polishing ability.
6. Rigging ability.
7. Painting ability.
8. Pipe fitting ability on sweated, threaded, flanged and poured joints.

Since the cost of a well equipped shop is a legitimate charge against service, just as is standby equipment, an excellent opportunity for training and giving experience to a larger than usual shop force is afforded, and the larger the force the more versatile and dependable it can be. Such increases in shop personnel can be made possible by diverting some of the money, normally expended in the purchase of spare parts, to labor costs for making these parts in the shop wherever they can be made at a saving or at the same cost. The rehabilitation of worn parts formerly discarded will allow exceptional savings as well as providing excellent experience.

If local trade schools are available, a policy of encouraging employees to go to school by paying tuition and fees will reap advantages both in improved work and in employee relationships.

Modern Maintenance Practice

The remarkable advances of the last two decades have revolutionized maintenance methods. Centrifugal pumps can now be made to last almost indefinitely by the use of modern methods. The outstanding difference between past and present practice is that in the past it was necessary to discard much good equipment with the bad. Today, with modern welding and metal spraying methods, only the bad need be touched and little or nothing discarded. A part repaired by metal spraying or welding is generally as good as, and often better than, the original part.

Each maintenance problem should be carefully studied so that the solution which is most economical in the long run can be selected. Often the shop cannot compete with mass production as practiced in many industries. Therefore, cost figures should be kept on all functions performed by the shop, so that its work can be confined to that which is economically justified.

Pump Construction vs. Economical Maintenance

Effective and economical maintenance requires that the machine to be maintained have design features that facilitate maintenance. Unfortunately the person charged with maintaining a machine often has no voice in its purchase. When a pump has defects it is often cheaper to correct them than to attempt to maintain the pump in its original form.

A case in point is the packing gland assembly. If the follower, lantern gland, and take-up bolts and nuts are of iron, resultant rust is certain to cause trouble. The follower will not be free, the take-up nuts will freeze on the bolts, the packing cannot be tightened with any assurance that the gland pressure will be proper, and the resultant improper gland pressure may cause excessive sleeve wear. The most effective remedy is to replace the iron parts with stainless steel or bronze.

At the St. Louis County Water Co., fourteen cast-iron followers on seven identical 18-inch pumps were replaced with bronze at a total cost of $98, including pattern cost, finishing and installation. The new followers were cast in a local foundry and finished in the plant shop. The original iron take-up bolts and nuts on the units had previously been replaced with brass. As a result of that experience company specifications for any new pump now call for a corrosion proof packing assembly.

Specifications should generally require renewable sleeves and wearing rings, though, if metal spraying (later described) is used as a regular maintenance procedure, they are not entirely necessary. It is desirable, too, to specify the use of high grade bronzes and brasses and, particularly, to avoid brasses of more than 15 per cent zinc—i. e., the so-called yellow brasses. When a pump is purchased, complete data concerning suction lift, total head and capacity should be given the manufacturer, so that a pump can be selected which will not be subject to cavitation.

The type of pump has a bearing on the cost of maintenance. Generally speaking, the split-case double-suction horizontal pump is the least costly to maintain. In the selection of the type of pump, factors affecting accessibility, such as whether the motor or some of the piping must be moved to disassemble the pump, should be considered in evaluating the initial cost and in determining the selection. If the pump is to handle an abrasive or corrosive liquid, consideration should be given to the use of special and more costly ma-

JOB REQUISITION №. 5749

FILE UNDER: No. 3 Stratman Pump
DATE March 1, 1941
ISSUED TO John J. Doe
ORDERED BY H.D.H.
AT REQUEST OF -----

CHARGE ACCOUNTS
LABOR 753-91
MATERIAL 753-91
EQUIPMENT TIME 753-91
TO BE COMPLETED By April 1, 1941

APPROVED BY Harry Smith ENGINEER.

ORDERS: Maintenance Card No. S56MSA3

WORK DONE -- REMARKS -- CONDITION OF EQUIPMENT -- ETC.

General condition of pump good.
Operation O.K. except outboard packing could not be drawn up to prevent excessive leakage.
Packing on that gland worn out. Repacked with graphited asbestos braided packing
Sleeve in good condition.

Alignment as found and left:

Pump 0.002 in. high
Pump 0.001 in. to west
Faces square

ST. LOUIS COUNTY WATER CO.
PRODUCTION DIVISION
FORM NO. P. 1

WORK COMPLETED: March 16 1941
SIGNED John J. Doe

OVER

COST DATA JOB REQUISITION №. 5749

LABOR -- ACCT. NO. 753-91

DATE	NAME	ON	OFF	HRS.	RATE	COST	CLERK'S O. K.
3/15	J. J. Doe	8 A.M.	12 Noon	4			
					TOTAL LABOR COST		

MATERIAL -- ACCT. NO. 753-91

DATE	QUANTITY	STOCK NO.	DESCRIPTION	UNIT COST	COST	CLERK'S O. K.
3/15	3#	A56	$\frac{7}{8}$-inch graphited asbestos packing			
3/15	1½ gal.	D21	Saline oil			
			TOTAL MATERIAL COST			

EQUIPMENT TIME -- ACCT. NO. 753-91

DATE	EQUIPMENT	HRS.	UNIT COST	COST
3/15	No. 22 Truck	4		
	TOTAL EQUIPMENT COST			

COST SUMMARY

ITEM	COST
LABOR	
MATERIAL	
EQUIPMENT TIME	
TOTAL	

Figs. 2A and 2B. Face and Reverse of Job Requisition Form Used by St. Louis County Water Co.

terials because these will probably give the lowest long-run cost. Forethought in the selection of a pump may prove the simplest means of avoiding troublesome maintenance problems.

Maintenance Program and Records

To minimize failures of pumps while in operation and at times when they can least be spared, a systematic and periodic procedure of inspection and maintenance is necessary. The working schedule should not be left to memory but should be incorporated in a card system rotated in a calendar file. A simple maintenance card form, 8 by 5 in. in size (Fig. 1), used by the St. Louis County Water Co., has been highly successful.

When a maintenance card is issued to a shop man, the "Job Requisition" shown in Figs. 2A and 2B accompanies the card. The person to whom the work is issued records on this requisition all time and material as well as all data regarding the condition of the equipment and the work done. Extra sheets are available if needed. The maintenance card is filled out with the date, job requisition, and signature of the person doing the work, and when the work is completed, the maintenance card is returned to the calendar file for its next regular turn. The job requisition is filed in an equipment file where, with other job requisitions and all pertinant data (for the same unit), a complete historical record is available.

The value of a routine scheduled maintenance program and a system of records is appreciated by conscientious workmen. It puts their work on record and creates in them the desire to do good work. By training and instructive criticism the average workman can be taught to record a useful account of the work he has done and the condition of the equipment. The value of such a system will be revealed many times. On numerous occasions, parts about to fail will be discovered. Factors which impair efficiency, but which do not affect operation, will be found where they might otherwise remain unnoticed. The plan will definitely reduce emergency repairs. The nature and frequency of inspections and work done should be varied, depending on the number of hours of operation, the character of the liquid being pumped and the experience gained in carrying out past maintenance work.

Daily and Hour-to-Hour Inspections

The daily and hour-to-hour inspections and observations should be made by the operators on duty. It is felt that the use of the card system is unnecessary for these functions. The operators must, however, be impressed with the importance of their responsibility to detect and report irregularities in the operation of a pump. Bearing and packing temperatures should be observed hourly. Abrupt changes in temperature are of much more significance than high temperatures taken alone. Bearings can operate in continuous service at temperatures of 160° F. The "old-timer's" criterion of whether or not he could hold his hand on the bearing is of little value in terms of modern concepts. A thermometer should be used to determine temperatures if there is any doubt.

Operators should observe whether or not the oil rings in ring-lubricated bearings are turning and lifting oil. They should be sure that oil levels are at proper height. Changes

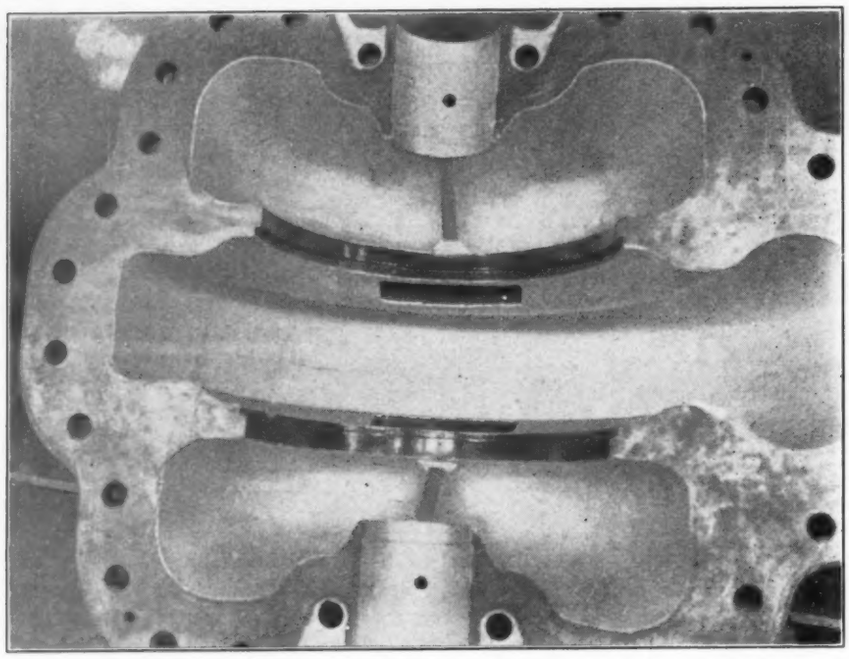


Fig. 3. Bonnet of 18-Inch Pump; After Surface Finishing and Painting

in the sound of a running pump should be investigated immediately. Operators should account for all changes in pressure or flow in the pump discharge, as such changes are often an indication that something is wrong with the pump. If the packing is water-sealed and lubricated, it must be observed regularly to determine whether or not some water is dripping from the gland. The gland pressure should be checked occasionally to see that it is adequate. The lightest pressure that will maintain the seal is adequate. Generally this means that the nuts should be only finger tight. The follower should always be square with the shaft. The best solution to most packing troubles is proper care during operation.

The superintendent or his assistant should scrutinize all recording charts for changes that indicate trouble in a pump. The daily log sheet should have a column for recording a computed efficiency, kilowatt hours used per thousand gallons or pounds of steam used per thousand gallons.

Semi-Annual Inspection And Maintenance

The semi-annual inspection should involve the use of maintenance cards and, preferably, should be done by someone other than the operator. In this inspection, the packing should be checked by the same procedure as outlined for the daily and hour-to-hour inspections. In addition, the follower should be removed and cleaned to be sure that nothing interferes with its free movement. The follower nuts and bolts should be cleaned and oiled. The gland should be repacked if there is evidence of improper functioning or if the follower is at the end of the take-up. Additional rings can be added if the balance of the packing is in good condition, but none should be added without first ascertaining that the lantern gland is centered under the sealing water inlet.

The alignment of the pump and driver should be checked, then corrected if necessary. Alignment should be kept within one or two thousandths of an inch, regardless of the type of coupling used. Oil lubricated bearings should be drained and refilled with fresh oil. Anti-friction bearings, i.e., ball or roller bearings using grease, should be checked to assure that the proper amount of lubricant is provided. Even on a continuously operating machine with anti-friction bearings, semi-annual lubrication checks are ample. Operators should not be permitted to add grease to these bearings unless they are properly trained to do the work. Generally more harm will result in over-greasing than in under-greasing where grease cups or pressure fittings are provided. Such devices often result in damage to the bearing seal and in excessive operating temperatures due to the fluid friction of excess grease. At the St. Louis County Water Co. plant, *all grease cups and pressure fittings are removed and plugged.* The operators are not permitted to lubricate anti-friction bearings.

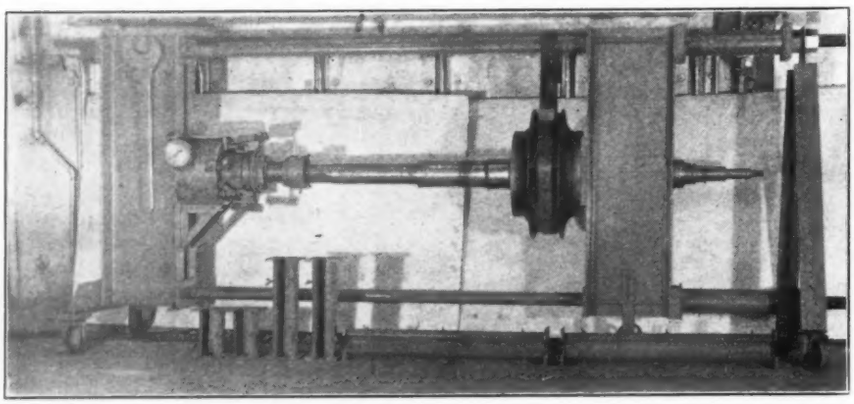


Fig. 4. Rotor Assembly, set up in forcing press preparatory to removing sleeves and impeller; press, constructed in shop of St. Louis County Water Co., uses 75-ton portable hydraulic jack with 9-inch stroke; on floor are spacers used ahead of nuts on right ends of draw rods; by various combination of spacers any length up to 84 in. can be accommodated in press.

Annual Inspection And Maintenance

Annual maintenance and inspection should also be scheduled through the medium of maintenance cards and should be done by the shop force. All work done at the semi-annual inspection should be repeated and, in addition, other more thorough inspections and checks should be made.

The bearings should be removed, cleaned with a suitable cleaning fluid and carefully examined for flaws. The bearing housing should be flushed and cleaned. Anti-friction bearings should be completely cleaned of all old lubricants and examined for scratches and wear. The bearing should be given a light coat of grease if it is grease lubricated. When replaced in the housing, if the bearing is on a horizontal shaft, grease should be added so that the bottom balls or rollers are about half-submerged. If the bearing is

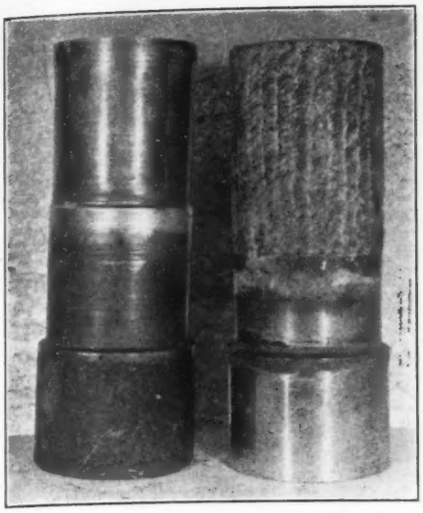


Fig. 5. Shaft Sleeves, Before and After Bronze Welding

on a vertical shaft, the quantity added should be just enough to allow the balls to pick up the grease without plowing through an excess. The packing should then be removed and all parts of the assembly cleaned. The sleeves should be examined for wear as carefully as possible without further disassembling the pump.

The coupling should be disconnected and its alignment checked. With the pump in this condition and with the packing out, it should be rotated by hand to detect any rubbing or looseness. On horizontal pumps, with the packing out, the pump uncoupled and the bearings in place, the rotor should be raised with a bar at each end and the amount of vertical shaft movement measured with a dial indicator or feeler gage. If the vertical movement is greater than 0.010 in., the cause should be determined. In a sleeve or babbitt bearing, it may be due to looseness of the bearing in the housing. This can sometimes be corrected by examining the housing halves and removing any paint or burrs that may be preventing them from seating properly. A gasket should never be used on these surfaces unless the bearing was designed for one originally. If it is found that the play is in the bearing proper, then it may be necessary to repour or rebuild the babbitt.

With the packing removed and the coupling disconnected, the end play of the pump should be checked. If greater than that recommended by the manufacturer, it should be remedied. If the thrust bearing is babbitt, repouring or rebuilding, as described later, may be necessary. If it is an anti-friction bearing, complete replacement may be the only solution.

Drains should be cleaned and flushed. Drip pans and the drip catches under the glands should be cleaned and painted with a good water-resistant paint. Inspection of the external painted finish of the pump should be made and it should be repainted or touched up if required. It will probably be necessary to touch up bolts and nuts loosened during the inspection.

When the pump is repacked, it is permissible to re-use the removed packing provided it has not been damaged, is resilient and contains no foreign matter. If it is necessary to discard more than two rings of the removed packing in a gland, it will be desirable to replace all of the packing. The usable packing remaining from both glands, if the pump has two, can be used to repack one gland while new packing is used in the other. Service conditions will determine packing practices, the type of packing used and its reasonable expected life. The procedure suggested here for the annual inspection of gland assemblies, however, should not be avoided because it may increase packing costs. Much serious trouble and expense may be avoided by making this annual inspection.

If at all practicable, an efficiency and delivery test of the pump should be included in the annual check-up. This should be taken care of by the use of a maintenance card issued to some member of the engineering staff or to the superintendent himself. Power input, total head, suction lift, speed and delivery are some of the items to be measured. A comparison should then be made with previous tests and with the manufacturer's characteristic curve to determine any course of action to be taken.

Fig. 6. Pump Sleeve, Being Built up by Welding

Work done in front of boiler door to allow draft to carry away brazing fumes; welder wearing aspirator supplied through hose on floor at left.

Complete Overhaul

Periodically every pump should be completely disassembled and overhauled. A maintenance card should be used to insure that this work is done according to a predetermined schedule. The frequency of this operation will depend entirely on the average operating time of the unit,

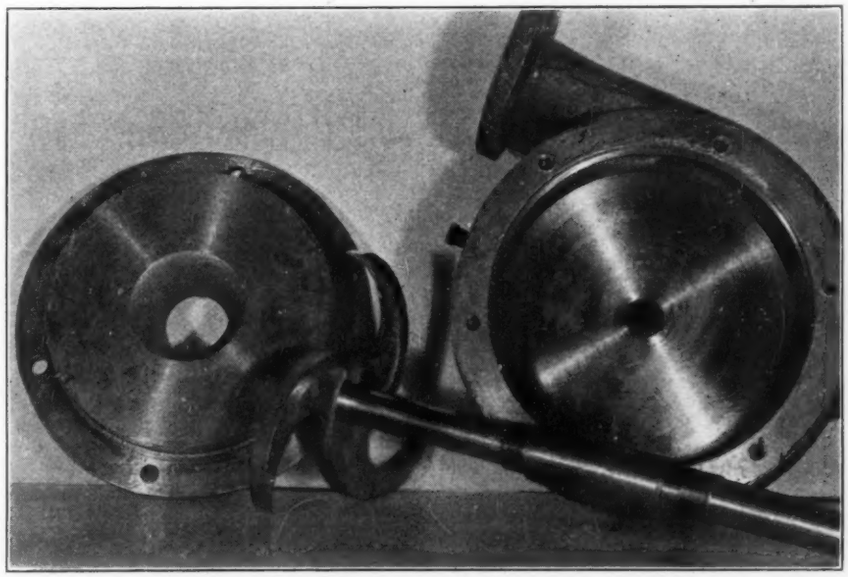


Fig. 7. Chemical Pump Parts After Refinishing

Portion of shaft near impeller hand-surfaced and ground to prevent packing wear; faces or impeller and casing machined to remove grooving and to make them true.

the type of water or liquid it is handling, the type of pump, its materials of construction, the importance of the unit and the maintenance technique. This schedule can easily be determined after several years' experience. In general, for pumps handling finished water, a three to five-year frequency is satisfactory. It would not be good practice to extend the frequency beyond five years because of the reassurance and confidence this inspection gives management.

If the pump is handling silt-laden abrasive raw water, annual overhauling may be required, particularly because of the increase in ring clearance and the consequent loss in efficiency. The intake pumps of the St. Louis County Water Co., handling raw Missouri River water, are overhauled annually because ring clearance in that time increases from 0.015 to 0.060 inch. The chemical pumps at the same plant are given a semi-annual internal inspection. The clear water pumps are overhauled every five years.

To facilitate the overhauling and to provide more complete stand-by it is often desirable to have a spare rotor, consisting of the shaft, impeller, wearing rings, and sleeves. Thus the time required to overhaul a pump can be materially reduced. The repair work on the spare rotor can be done at a later date when it is convenient.

Casing Maintenance

In the interest of maintaining high efficiency it is desirable to keep the pump casing and its water passages smooth and free from rust tubercles. A new pump may have many casing irregularities unless the specifications call for a smooth finished interior. During the first overhaul, the interior should be made smooth with power wire brushes and grinding wheels. After the surface has been thoroughly cleaned, it should be given no less than four coats of a good underwater paint. A paint of the phenol-formaldehyde type with aluminum powder has been found to give fair protection for three to five years at the St. Louis County Water Co. (The substitution of St. Louis for St. Louis County Water Co. will make reference to the City of St. Louis Water Works.) Care should be taken not to put more than one coat of paint on the casing ring seats. The bonnet flanges should not be painted because the gasket may thereby be caused to stick. Figure 3 shows a pump bonnet after finishing and painting.

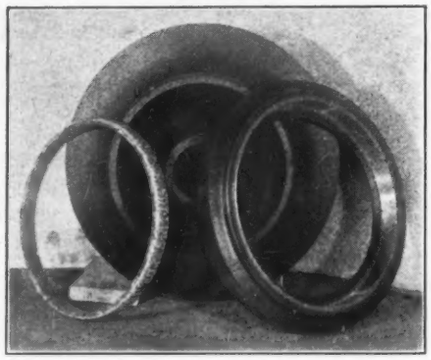


Fig. 8. 20-Inch Pump Impeller
Refinished casing ring at right and bronze built-up impeller ring at left.

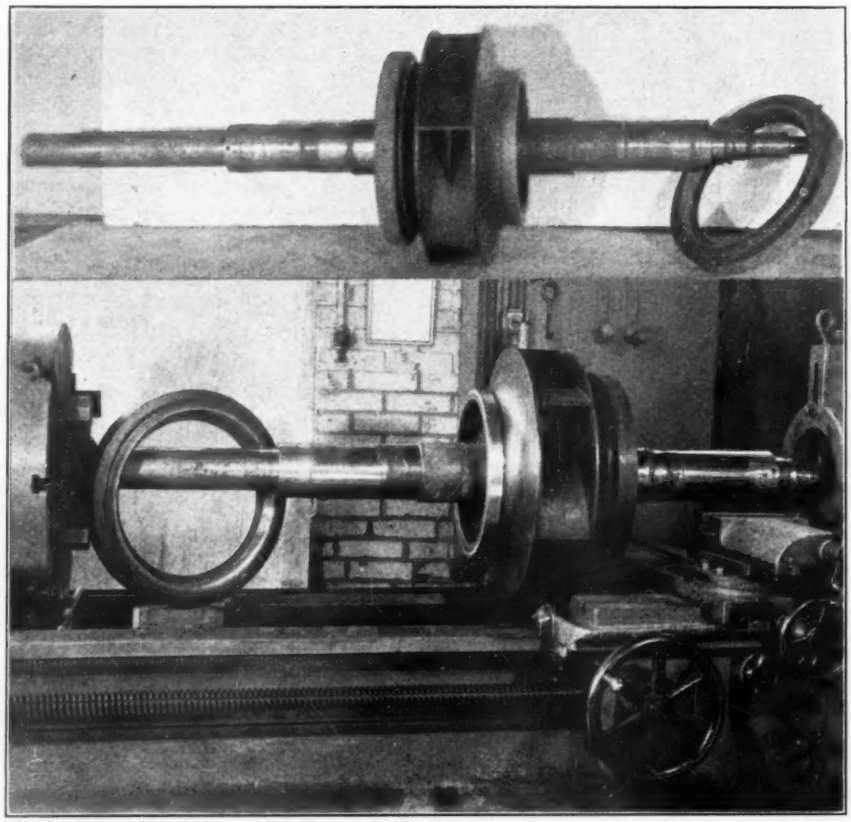
The spraying of molten zinc or aluminum on the interior surfaces of the casing is suggested as a better means of maintaining smooth corrosion-proof internal surfaces. The writer has had no experience with such practice, but it has been applied successfully to the interiors of large needle valves in hydroelectric works.

If the casing is worn or pitted in places, these portions should be restored by welding or metal spraying. At the St. Louis County Water Co. (the substitution of St. Louis for St. Louis County Water Co. will make reference to the City of St. Louis Water Works), a 16-inch double suction intake pump casing, which was damaged by sand wear to the extent that complete replacement was imminent, was restored to the usefulness of a new casing by bronze welding at a cost of $170. This work was done in 1933, at which time it was expedient to remove the unit to a local shop, where the entire casting could be preheated while the welding was done. Today the job would be done by the maintenance force and it would not be necessary to remove the casing from its setting.

Sleeve Maintenance

A badly grooved sleeve should not be put back into service. If the grooving is only minor, i.e., not more than 1/32 inch deep, the packing wearing surface can be refinished under size. If this is done, care should be taken that the clearance at the base of the stuffing box is not so great that packing is forced through into the pump interior. To remedy this, a brass ring about 3/16 in. thick and having not more than 1/32 inch clearance with the shaft can be inserted in the base of the stuffing box. This same expedient can be used in any stuffing box where the packing may be forced into the pump interior.

If the grooving is excessive, re-



Figs. 9 and 10. 20-Inch Pump Rotor
Before (above) and after (below) restoring sleeve and wearing ring surfaces.

pair or replacement of the sleeve is necessary. The procedure to be followed will be determined by the cost of a new sleeve and the cost of repairing the old. Experience at the St. Louis County Water Co. indicates that it is generally less costly to restore the old sleeve by bronze welding in the plant shop. Figures 4, 5 and 6 show various steps in the progress of this work on the sleeves of a 20-inch double suction pump. Unless the sleeve is worn very deep, it should be undercut in a lathe 3/32 to ⅛ before applying the overlay. Manganese bronze is applied with an oxyacetylene torch, as shown in Fig. 6.

After the welding is completed, the rotor parts are reassembled and the work put in the lathe for refinishing. It will be found impossible to assemble purchased parts on an old shaft and have all finished surfaces concentric with the axis of the shaft. This applies especially to the ring and sleeve surfaces. By finishing sleeve and wearing ring surfaces in the lathe with the rotor completely assembled, a perfect job in this respect is assured. It is particularly advantageous to follow this procedure on sleeve surfaces because eccentricity is one of the most frequent causes of packing trouble and the most difficult to be remedied. It is desirable to finish the sleeve by polishing, as this reduces wear and friction.

Metal Spraying

For maintenance of sleeves, metal spraying is particularly advantageous and economical, since it is unnecessary to remove the parts from the shaft. The rotor is set up in the lathe, the surfaces to be built up are undercut and roughened, sprayed metal is applied, and the surfaces are refinished without removing the rotor from the lathe. The amount of machining is minimized because sprayed metal can be applied to not more than 0.030 inch over size. Metal spraying offers an added advantage in that hard alloys, which will give better performance than the original metal, can be used, whereas the welding process is largely limited to bronze because of the distortion resulting from building up by fusion welding. It is entirely possible to complete a sleeve maintenance job by the use of metal spraying without removing the rotor from the pump. After spraying, the work can be machined or ground in place.

At the St. Louis County Water Co. (the substitution of St. Louis for St. Louis County Water Co. will make reference to the City of St. Louis Water Works), in the maintenance of some chemical pumps handling abrasive and corrosive materials, the packing wearing surfaces are coated with "Stellite," a nonferrous hard surfacing material applied by the oxyacetylene flame. This process is quite costly because of the initial cost of the material and particularly because the finishing must be done by grinding. The resultant job, however, will outlast most materials several times. The shaft in Fig. 7, which does not have renewable sleeves, was resurfaced near the impeller by this method at a cost of $12. A new shaft of special alloy costs $22 in comparison.

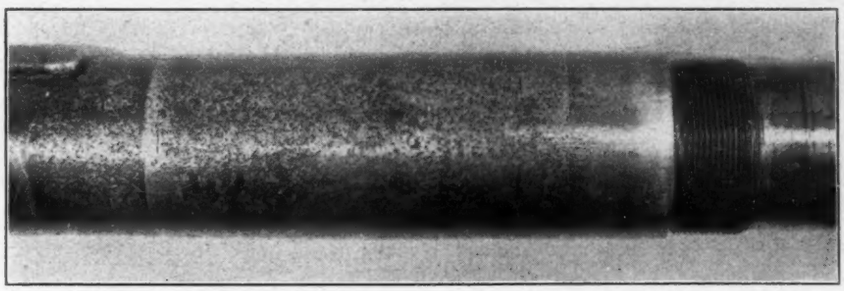


Fig. 11. Portion of 4-Inch Diameter Shaft of 20-Inch Pump Showing rusting and pitting caused by water leakage through joints between impeller and sleeves.

Figure 7 also shows impeller and casing wearing surfaces of this pump after they had been refinished in a lathe. The flange on the pump head was undercut to allow the pump to be reassembled with proper clearance. Reassembling involved using shims and gaskets at various places to allow assembling with about 0.010 inch clearance on the front and back side of the impeller. The reduction in thickness of the impeller as a result of refinishing causes some reduction in the capacity of the unit, which, however, for the application can be tolerated. At a later date the impeller edges will be built up or a new impeller installed to restore the unit to its original capacity.

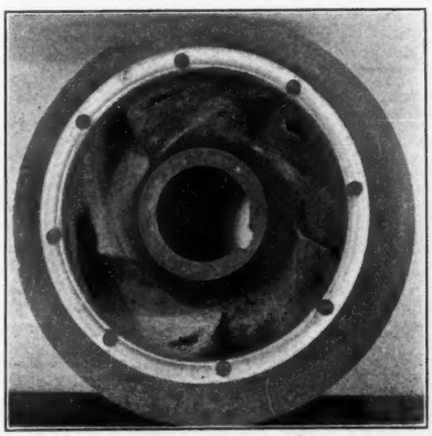


Fig. 12. Impeller of 12-Inch Raw Water Pump Showing effect of cavitation and abrasion

If considerable abrasive material is present in the water being pumped, as is often the case with raw water pumps, clear water should be used on the seal. If clear water is not available, a waterproof grease seal may be used or any one of a number of plastic packings, which require no sealing fluid, can be employed.

Wearing Ring Maintenance

Wearing ring maintenance is desirable whenever the clearance exceeds 0.015 to 0.025 inch. Excessive ring clearance reduces efficiency. For wearing ring repairs, as for the sleeve repairs, the cost of new parts as opposed to resurfacing by welding or metal spraying should be the deciding factor. The procedure followed at the St. Louis County Water Co. (the substitution of St. Louis for St. Louis County Water Co. will make reference to the City of St. Louis Water Works) is to resurface with bronze welding. Figure 8 shows a rebuilt impeller ring, preparatory to refinishing, and its companion casing ring.

To make such a repair only one ring need be rebuilt. The other is machined to a smooth surface and the built-up companion ring machined to fit. By alternately rebuilding one and then the other, the same rings can be made to last indefinitely. Impeller rings should be machine assembled on the impeller and shaft. The fit should be 0.010 to 0.015 inch, depending on the condition of the bearings and casing. When the rotor is assembled in the pump, faulty bearings or a poor fit of the casing rings in the casing may cause the rings to rub. If there is rubbing, these items should be checked before the clearance is increased. A close fit means higher efficiency. This procedure is for flat surface rings; labyrinth rings and other types will require a modified technique.

The complete ring and sleeve repair on the 20-inch pump rotor as illustrated "before and after" in Figures 9 and 10 cost $75.

A remedy resorted to in some instances where excessive abrasion is encountered, as is unavoidable in raw water pumps handling highly turbid water, is to use clear water for flushing the rings. This is done by machining an annular groove in the center of the rings to act as a water passage, tapping this groove in several places from the outside of the casing and connecting the taps to a clear water supply. The pressure in the annular space must be maintained higher than the pump discharge pressure and must be applied at all times during the operation of the pump. In this way the gritty water being pumped will be prevented by the outflowing clear water from entering the space between the rings.

Shaft Maintenance

The shaft should be straight, its bearing surfaces smooth, and the impeller and sleeves should fit tightly. The machined surfaces of the rings, sleeves and bearings should be concentric with the axis of the shaft to within 0.001 to 0.002 inch.

A frequent cause of poor fit of impeller and sleeves is rusting and pitting of the shaft, resulting from water entering the joints between the impeller and the sleeves. In assembling the rotor, the end surfaces must be true and plastic non-hardening filler should be used in the joints. Figure 11 shows a shaft where pitting and rusting has progressed to the point where a tight fit is no longer possible.

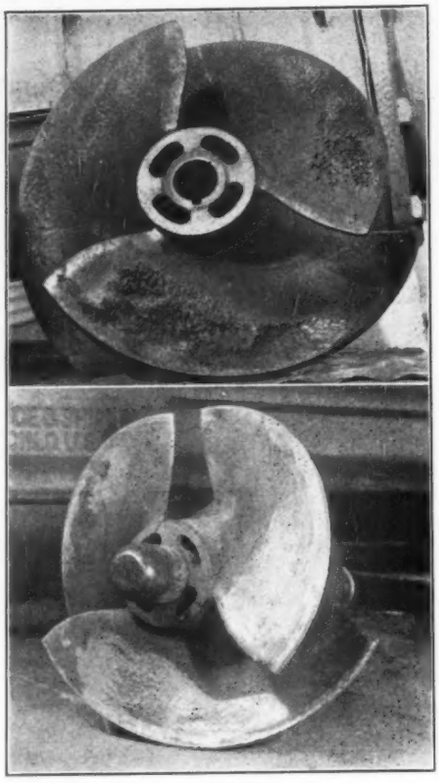


Fig. 13. 24-Inch Mix-Flow Impeller
Showing (above) effect of cavitation, and (below) repairs and restoration to original diameter.

Due to the distortion that would result if the original size were restored by adding metal by brazing or welding, such a procedure is not possible. By the use of metal spraying, however, the shaft can be restored to size at reasonable cost. By spraying with stainless steel, the shaft can be made better than its original form, as no subsequent pitting will take place. Metal spraying can also be used to restore a grooved bearing surface on a shaft. It is entirely possible to add sprayed metal and to finish the surface in place without removing the shaft from the pump. The fit of a coupling on a shaft can also be restored by metal spraying.

Bearing Maintenance

If an anti-friction bearing becomes damaged, it must be either reground or replaced. The regrinding must be done by the bearing manufacturer or someone similarly equipped to do the work. Regrinding generally costs from one-half to two-thirds the cost of a new bearing. There are some who feel that the practice is not advisable because, in their opinion, the reground bearing is not as good as a new one. At the St. Louis County Water Co., however, a reground bearing, the repair cost of which is about half the cost of a new bearing (a saving of about $45), is giving excellent service. Incidentally, it may be pointed out here that it is desirable to carry spare bearings for all important pumps provided with the anti-friction type of bearing.

When the clearance of babbitt bearings is in excess of 0.005 to 0.010 inch, depending on the diameter of the shaft, corrective measures should be taken. It is good practice to repour the bearing using an undersize shaft and to restore it to size by machining in a lathe. This procedure minimizes the amount of scraping and insures a close fit. Surface imperfections which result when the babbitt is poured directly against the shaft generally results in a loose fit by the time the bearing is properly seated. Babbitt surfaces can be built successfully by the use of an oxyacetylene torch. This procedure is especially advantageous for repairing local defects. On small bearings it is sometimes faster than repouring the entire bearing. Babbitt can also be metal sprayed. This technique of metal spraying probably represents the most practical and economical means of restoring bearing surfaces.

Impeller Maintenance

Abrasion, corrosion, or cavitation may call for impeller maintenance. In clear water service, abrasion and corrosion will be at a minimum and

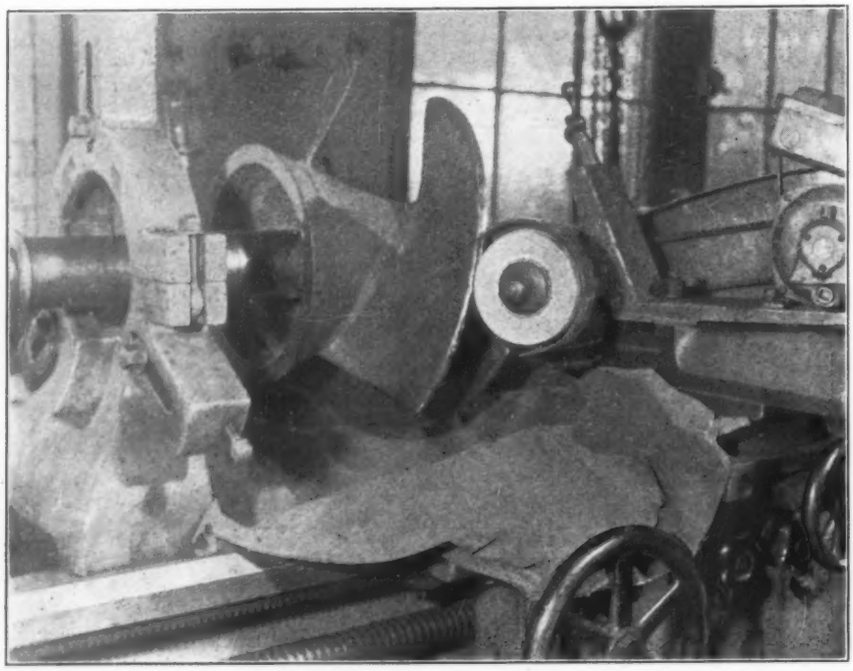


Fig. 14. 24-Inch Mix-Flow Impeller
Showing finish grinding of outside edges after building up with stainless steel.

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Wolf Creek Ord. Plant, Tenn.
Umatilla Ord. Depot, Ore.
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San Jacinto Ord. Depot, Tex. (2)
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Normoyle Q. M. Depot, Tex.
Dodd Field, Texas
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Heald Machine Co., Mass.
Austin Co., Calif.
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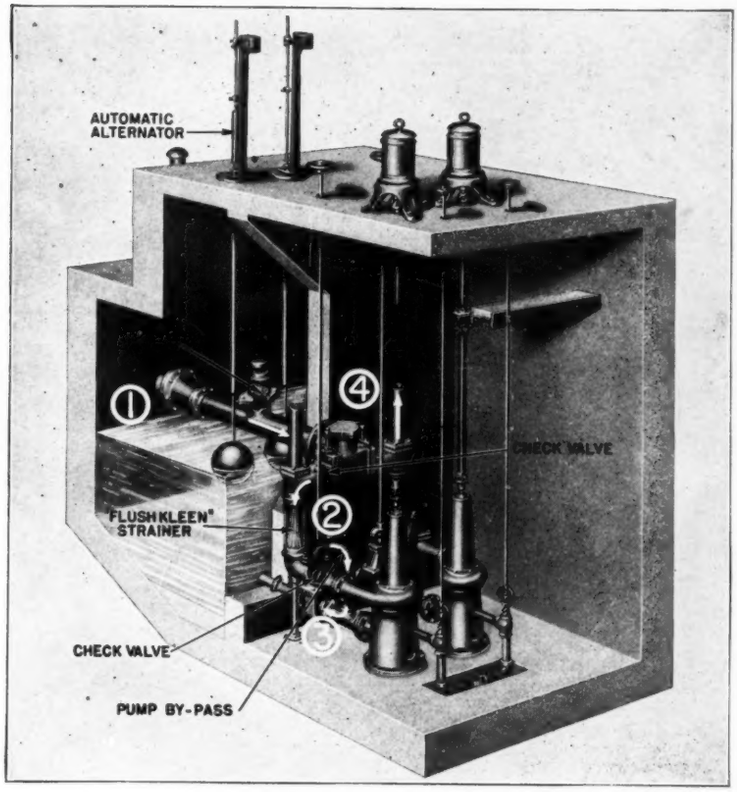

SOLIDS DO NOT REACH PUMP IMPELLER

While One Pump Is Operating, Sewage Flows Into the Basin Through the Pump By-Pass.

FILLING WET WELL

① Sewage flows through inlet pipe.
② Coarse sewage matter is retained by strainer.
③ Strained sewage flows through pump by-pass to basin.

PUMPING

③ Strained sewage is pumped from basin. Check valve of pump by-pass closes.
② Coarse sewage matter is backwashed from strainer.
④ Special check valve closes; sewage and coarse matter are pumped to sewers.

Both pumps operate under peak flows.

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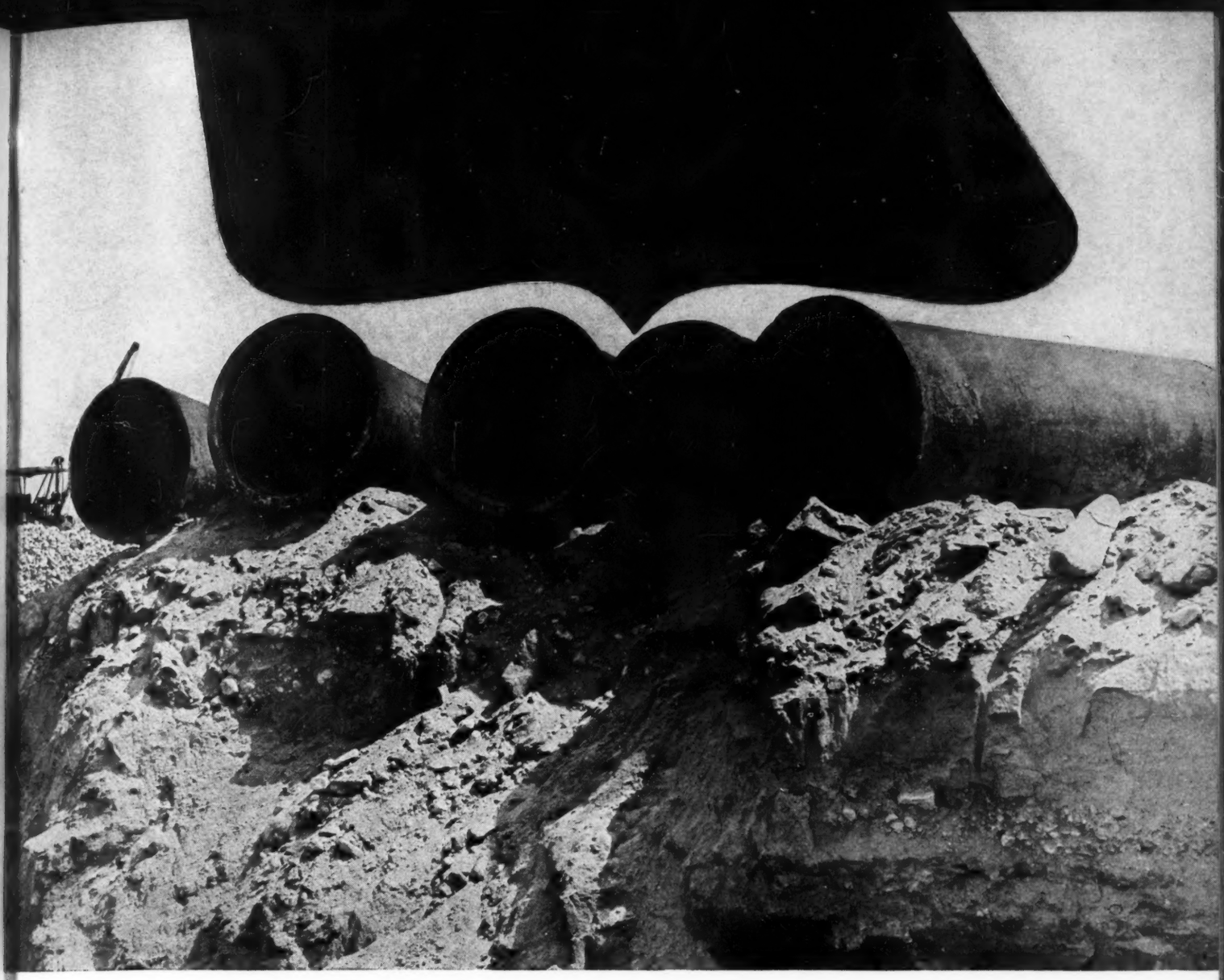
INDUSTRIAL CHEMICAL SALES



THIRTEEN years ago the City of Philadelphia salvaged, reconditioned and sold to the City of Glendale, California, a 24-year old, 48-inch cast iron water main removed on account of subway construction. Glendale used the salvaged pipe, bought at a substantial saving, in the construction of an intercepting sewer crossing under the Los Angeles River. In 1938, after satisfactory service in its second location for 13 years, it became necessary to re-route the sewer line. The city authorities thereupon decided to take up the pipe for the second time and re-use it in a third location.

It is impossible to foretell future requirements or population shifts in metropolitan cities but any public official can be sure that, when water or sewer mains must be abandoned or re-routed, the pipe can be salvaged or re-used, if it is cast iron pipe.

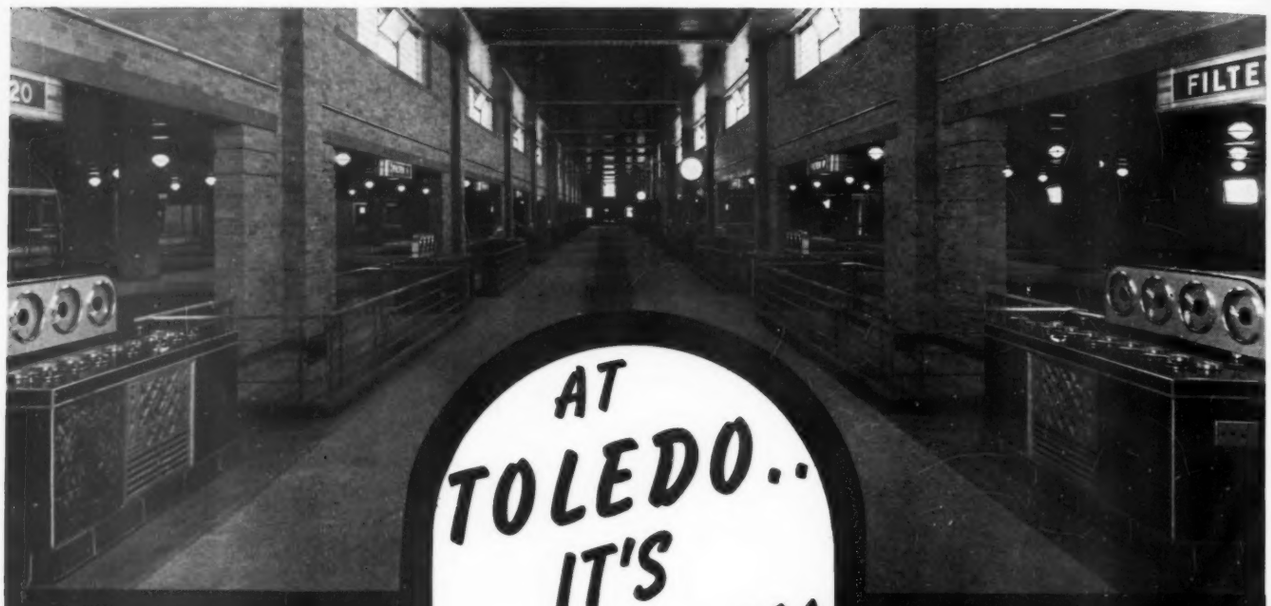
Pipe bearing this mark is cast iron pipe.

TRADE MARK REG.

Available in diameters from 1¼ to 84 inches.

CAST IRON PIPE RESEARCH ASSOCIATION, THOMAS F. WOLFE, RESEARCH ENGINEER, 1015 PEOPLES GAS BUILDING, CHICAGO, ILLINOIS

CAST IRON PIPE



AT TOLEDO.. IT'S SIMPLEX AGAIN!

THE RECORD AT TOLEDO

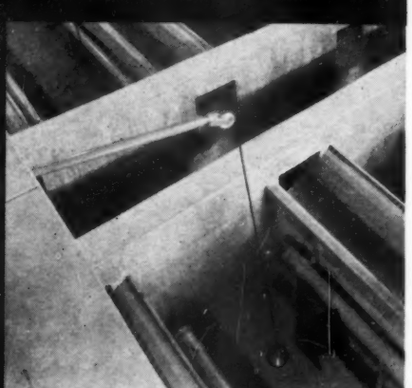
1921—34 Simplex Controllers installed.

1929—22 Simplex Controllers added. At which time all 56 were coordinated with Simplex Master Control System including the usual gauges and meters.

AND NOW IN 1941—A NEW PLANT AT TOLEDO—The Last Word In Modern Design *IT'S SIMPLEX AGAIN!*

SIMPLEX VALVE & METER CO.
6743 Upland St., Phila., Pa.

Effluent Controller—One of the forty 5 Controllers showing Master Control Counter Weight.


Sand Expansion Float Units.

Master Panel in H. P. Pumping Station showing five 36" individual pump discharge meters, total flow meter and recording elevation gauges.

W. W. Controllers—24" Controllers for under and surface Wash.

One of the Simplex Panel Groups.

Two 60" Raw Water Venturi Tubes and M. O. Meters.

Greeley & Hanson Consulting Engineers. Pitt Const. Co. & A. Bentley & Sons . . . Equipment Contractors.

an impeller can be expected to give fifteen to twenty years' life unless it is worn by cavitation. In raw water service, abrasion may necessitate periodic maintenance. Cavitation, wherever it exists, requires periodic inspection and replacement of lost metal. Figure 12 shows an impeller that was in use in raw water service where cavitation and abrasion rendered it economically beyond repair. Periodic maintenance could have given this impeller an indefinite life.

Figure 13 shows the results of cavitation on a cast-iron mix-flow impeller and the same impeller repaired by the use of stainless steel applied by oxyacetylene welding; Figure 14 shows how the original diameter was restored by finish grinding the blade edges after they had been built up with stainless steel. Work such as this can generally be done at much less than the cost of a new impeller. Metal spraying has also been used successfully in the restoration of metal lost due to wear and cavitation.

Cavitation is caused by defects in the design or application of a pump. The only remedy is correction of the conditions causing it or periodic restoration of lost metal. The frequency of this periodic replacement of metal should be determined by the number of hours the unit operates and by the severity of the cavitation. Stainless steel, finished to a polished surface, has been found to give better protection, wherever cavitation is encountered, than most other metals.

An example of how special alloy castings can solve a maintenance problem at extremely low cost is illustrated by the method followed by the St. Louis County Water Co. in maintaining five identical small size ½-hp. open impeller pumps handling lime slurry and ferrous sulfate solution. These pumps, which are subject to abrasion, are of inexpensive all-iron construction. They were being maintained, by the use of "Stellite" on surfaces subject to abrasion, at an annual cost which represented a saving over an initial installation of abrasion resistant pumps. The application of "Stellite" to the thin edges of the impeller blades resulted, however, in a weakening of the cast-iron blades so that eventually they failed. Special alloy hard castings were obtained from a local foundry, using a new cast-iron impeller as a pattern. Alterations to the cast-iron impeller cost $5.50 to make it suitable for a pattern. Six impellers were cast of high chrome alloy steel which was subsequently heat treated to produce a hardness of over 600 Brinell. Before heat treating, the impellers were machined, bored and key-seated in the plant shop. The unit cost of making these abrasion resistant impellers was slightly less than the $7.50 the manufacturer charged just for a cast-iron impeller.

Changes in maintenance technique will take place in the future just as they have in the past. Water works management should keep informed of the progress being made and adopt such methods as are applicable to its problems.

What "Hair of Gasoline" Drives Your Car or Truck?

By W. F. Schaphorst, M.E., Newark, N. J.

When the late Dr. W. F. M. Goss was president of the American Society of Mechanical Engineers I heard him deliver an interesting lecture on locomotives and their efficiency. He made one statement that has "stuck to me" ever since, namely, that the fuel consumption of an efficient locomotive is so small that if it could take on its coal in the form of a solid bar of coal as it went along, the bar would be no larger in diameter than an ordinary lead pencil. I thought that was a very interesting way of putting this surprising fact.

In a similar way, perhaps, you would like to know the diameter of a continuous stream of gasoline sufficient in size to operate your car or truck. Here are the figures for some of the common mileages per gallon of gas as well as for uncommon mileages:

Miles per Gallon	Diameter of constant stream of gasoline
5	0.0304 in.
8	0.0242 in.
10	0.0215 in.
15	0.0176 in.
20	0.0152 in.
25	0.0136 in.
30	0.0124 in.

In other words, if you get 15 miles per gallon out of your car or truck, the "thread of gasoline" running your vehicle would be only 0.0176 inches in diameter, which is less than two one-hundredths of an inch. Some of these diameters are not much larger than certain black hairs which run from 1/450 to 1/140 of an inch in diameter. (Flaxen hair, by the way, is the finest hair, running from 1/1500 to 1/150 of an inch in diameter).

From this writer's viewpoint the performance of modern cars and trucks is "marvelous" when considered in the above manner. Visualize, if you can, that thin hair of gasoline as you drive along in your car, and the energy it gives up, and you will have a higher regard for the accomplishments of present day automobile and truck manufacturers.

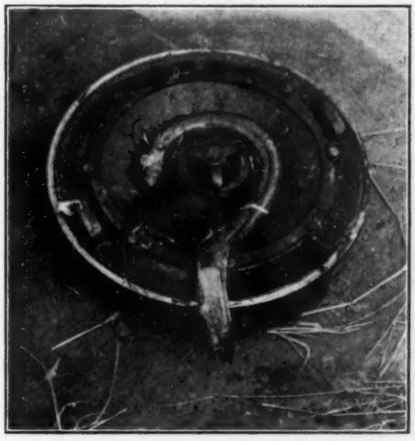
[If the layman were to read this item first and then be reminded how brief a time it takes him to travel 15 miles in his car he would appreciate what a leak the size of Mr. Schaphorst's black hair can run to in gallons per day—a gallon every 20 minutes or 72 gals. per day is what that hair sized leak costs.—Ed.]

Tulsa to Have $3,800,000 Sewerage Project

The voters of Tulsa, Okla., recently approved a bond issue of $3,800,000 to finance sewerage improvements and sewage treatment for this city.

A Meter That Could Take It—An Eel That Couldn't

This interesting photograph sent us by "Bob" Ferguson of the Hersey Mfg. Co. shows perhaps one reason why records fail to show what comes of all water pumped into distribution systems.



Failures of this 4 in. disc meter to register properly disclosed slight obstruction in the way of a badly chewed up eel, that part remaining in the meter being about 2 in. in diameter and 18 in. long. We wonder who drank the eel soup from the rest of him?

This picture is printed also for the benefit of any who may be having difficulties in persuading the Town Council of the value of a filtration plant.

LITTLE JACKIE AND HIS BEAN STALK

A Story of a Bean-Sprouting Contest in Which Some Magic Black Dirt Figured

By R. W. FRAZIER
Superintendent
SEWAGE COMMISSION
OSHKOSH, WIS.

SLUDGE fertilizer from the Sewage Treatment Plant here at Oshkosh, Wisconsin, was being distributed by the Board of Education truck to the various school grounds for use as a lawn conditioner. The truck merely hauled the material to the different locations and dumped it in a pile for wheel-barrow distribution by the custodians.

It was Spring and the weather was warm and balmy. At one of these schools, the Roosevelt, Miss Gladys Ihde conducts a class for underprivileged children. As a project for these children, she asked that each child bring a small flower-pot or tin-can filled with black earth, and announced that they would grow some seeds indoors on the window-sills, and that each child would care for and water his or her tin-can or flower-pot.

On Monday morning all the children had brought a can or pot to school. All was in readiness for the planting, when it was discovered that one small boy had brought a flower-pot but had neglested to fill it with earth. So, Miss Ihde told little Jackie to run outside and try to find some dirt (preferably some black dirt) and fill his flower-pot.

When Jackie got outside he spied what he took to be a nice pile of black dirt which had been dumped on the edge of the lawn. Forthwith he filled his container and soon was back with the class.

To create interest among the children, this planting was to be competitive, and each child selected one bean seed from the teacher's supply, and carefully planted and watered it. The pots and tins were then labeled and placed on the window sills. After the watering, Miss Ihde noticed a "foreign" odor in the room but thought nothing of it.

Interest in the planting was high, and the children carefully nursed along their particular container with water and sunlight. Nearly all of them were conscious of a peculiar odor in the class-room most of the time and particularly after the waterings, but everyone, including the teacher, kept the matter to themselves.

In a few days, Jackie's pot showed a light green stalk peering out into the open, while none of the other tins and pots showed visible evidence of seed growth. Naturally the interest of the class and the teacher was centered on Jackie's bean sprout and our young horticulturist was sincerely commended for his ability as a gardener. Meanwhile, the odor in the classroom was getting under Miss Ihde's skin as she had decided that it was not merely of temporary nature. So, in inspecting Jackie's bean sprout she found the source of the odor and asked Jackie some pertinent questions about where he had procured the dirt for his flower-pot. Jackie replied that he had gotten it from the pile of "black dirt" at the edge of the lawn and conducted her to the school doorway and showed her the pile. Miss Ihde couldn't see anything wrong with the pile of "black dirt" from where she stood, so dismissed the matter for the time being.

Later in the day, however, she questioned one of the custodians concerning the piles of "black dirt" on the lawn and got straightened out on the matter of sludge fertilizer, with the result that the "mystery of the class-room odor" was cleared up. Being a good sport, she allowed Jackie to keep his flower-pot in the bean-growing contest to the end, odor and all, with the result that our young gardener won the contest with no close competition at all.

Which all goes to show that sludge is valuable as a "growing agent" even under extreme conditions.

A Tip to Jackie

Next time take only one-fifth sludge and four-fifths dirt and place a good layer of clear black dirt on top of the pot. You'll most probably win the contest again and avoid the odor that the teacher objected to.

Only 0.3 Milli-amps per Sq. Ft. Required in Cathodic Protection (A Correction)

We are sorry to learn that a mistake was made in reporting the paper read by Mr. A. B. MacTaggart of the Rusta-Restor Corporation before the Virginia Section of A.W.W.A.

Mr. MacTaggart calls attention to this mistake, which appears on page 35 of our January issue. The statement is made that in cathodic protection the current requirement considered to be a minimum is "0.3 amperes per minute for each square foot of protected tank surface." Fact is, the minimum requirement is just 1/1000th this amount of current. The statement intended was that the required current flow is 0.3 milliamps. per square foot. This error was made in the transcription from notes which showed the correct figure, the "milli" being dropped in transcribing. Another error is that the current required is 0.3 milliamps. per hour and not "per minute" as appear in the report.

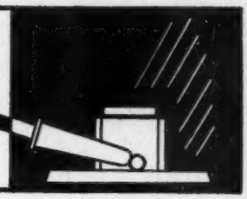
Mr. MacTaggart also calls attention to the fact that we credit him with conceding a value in the protective hydrogen film in cathodic protection, whereas he classifies the protective film idea as questionable. The first error is explainable, but the last is not. It is not usual that we misquote speakers, but in this instance of very cold notes used we feared that we might, and especially invited corrections. Our sincere regrets and apologies Mr. MacTaggart, but you will never catch us again we wager.

Drought Forces Rochester to Buy Water from Industrial Plant

Rochester, N. Y., faced with an imminent shortage of water created by the protracted drought, is fortunate in being able to buy filtered Lake Ontario water from the Eastman Kodak Co. for the period of the emergency.

Rainfall in the Rochester area for 1941 was 6 inches below the average for the past 50 years. At the same time war industry has required an added 3 mgd. to the normal consumption. Fortunate for Rochester it has a "good neighbor" industry to call upon. The Eastman Co. is delivering the water to the City at exactly production costs.

The Editor's Comments



Success in Municipal Operation

SO impressed were we with an editorial appearing in the *Milwaukee Journal* concerning the business-like management and financial success of the publicly owned water utility of its neighbor city—Waukesha, Wis.—that we immediately wrote Arthur P. Kuranz, Superintendent of the Commission Managed Water Department of Waukesha, requesting that he give us further details concerning the "why" of this successful operating history and the splendid financial condition of the local water utility which not only permits the annual payment of taxes plus healthy dividends into the Waukesha Treasury but allows another rate reduction.

Mr. Kuranz's story came through in time for printing in this issue. It is worth reading, not alone as a splendid commentary on Commission Management of publicly owned utilities, but also as a commentary on business-like supervision and application of the rules of sound industrial management and private ownership to publicly owned plants.

Wisconsin was one of the first if not the first States to place the operation of municipally owned utility plants under the Public Service Commission and Waukesha, like many other Wisconsin cities, has much to be thankful for in this development which has been for the most part effective in keeping water utilities out of the hands of politicians.

The history of the Waukesha Water Department seems to reveal that prior to Commission Management it was for 17 years run indifferently at a cost of about $20,000 annually to taxpayers for defraying the net loss in plant operation and maintenance. In fact, the *Milwaukee Journal* cites it as one of those examples cited to show that municipal ownership of utilities was a failure.

With the change in policy and type of management, which took place some ten years ago, it is interesting reading to see what took place. In these 10 years of Commission Management not a dollar has been appropriated by the city. Instead the Water Department paid all interest on its bonds and began retiring them. It paid for all improvements out of income and paid taxes to the city in addition. Then it began also to pay the city "dividends" on its investment (equity in the property) and made progress in retiring that equity. The comparison in managements becomes the more impressive still when considering that instead of the city paying in over $400,000, to keep the plant going during the first 17 years, in the last 10 years the Water Commission has brought into the city treasury $320,000 in taxes, dividends and equity retirement. So it becomes a fact that in the past 10 years the Water Utility has been worth $520,000 to Waukesha due to the fact that it no longer was drained of $20,000 annually for the 10 years and actually received the $320,000 in hard cash—a net of $520,000 saved the taxpayers of Waukesha, any way you want to figure it in a 10-year period.

Now with the high perfection of metering, waste reduction and good management in general it has been permissible for the Water Commission to once more reduce water rates to the lowest point in Waukesha's history. And at the same time the general tax rate, dropped 20 cents in Waukesha.

This to our mind is an outstanding example of success in municipal management and what can be when public utility operation is completely divorced from political interference.

Furthermore it stands out as an example of what Public Service Commission supervision of municipal plants can be responsible for, because it was pressure from the State Commission that persuaded Waukesha to adopt the local Commission Management which has turned Waukesha's Water Utility from a glaring example of municipal mismanagement and failure to a splendid example of what can be under municipal ownership with business-like management.

It is with much satisfaction that we can in this space praise Chairman J. S. Laing, and his associates Henry E. Blair and Killian Weber of the Water Commission —and their good fortune of having an Arthur Kuranz for manager.

Water, War and National Calamity

WITH blotches of rain smearing the windows of the writer's office, our thoughts go out afar to droughts, deserts, war and a National calamity caused by water supply failure—the fall of Hongkong, and now the disastrous fall of Singapore!

Deficiency in rainfall and snow of the past year or more is making its effects felt rather pronouncedly on public water supplies in the North Atlantic and New England regions. Rochester goes to a local industry to buy water, while the Portland (Maine) Water District with its great Sebago Lake is with real concern watching a steady lowering not experienced since 1905 and no recuperation of importance in sight from the lacking snow blanket this winter.

Over the country there are many Rochesters and Portlands, to make a discomforting picture which is taking the form of what has been presaged by Mr. H. P. Gillette in his Weather Cycle Theories and predictions

published in various issues of this magazine. Bolstered by earlier successful predictions of dry periods, his latest, which appears in the December, 1941, issue, warns us that the present dry period is just the beginning of a discontinuous but cumulatively drastic drying up of our surface waters. For 48 years ahead he predicts worsening conditions until the year 1984, when we may expect the minimum of precipitation in the cycles of years. After 1984 the pendulum of the long cycle, and shorter subcycles, will begin to swing back to gradually increasing precipitation. But many of us will not be here to witness the correctness or failure of this prediction. As one answer in the dilemma which many communities may find themselves facing, Mr. Gillette suggests that engineers turn *now* to locating ground water sources and the development of economical and effective ground storage as the most practical solution.

When we think of water supply failure our thoughts naturally turn to water and war. What can be taken as the highest cost of water supply failure to a great Nation and a goodly part of the whole world has been witnessed in the past month or so. The high importance of dependable water supply to the armies fighting for water and life in the African desert campaigns has been costly demonstrated. But more spectacular and of even greater cost to several nations at once has been the failure of water supply, which first caused the fall of Hongkong and then, within the week, the more disastrous fall of Singapore.

Singapore, like Hongkong, was surrendered as the least costly termination of a hopeless holding out in the face of a certain famine if nothing worse. In fact, until the shrewd enemy seriously damaged the supply works and actually secured possession of important supply reservoirs there had been nothing but bull-dog British determination to fight out the siege of Singapore to the last man. Defeat could not be avoided after the capture and command of the source of water supply for the besieged citadel, regardless of its military strength.

Here is a story that may well be advantageously used to impress those citizens who otherwise give little thought, if any, to the importance of dependable water supply. We would urge water works managers and others to request local editors to put to good use the story of the disaster of Hongkong and Singapore because of failure of water supply at a crucial time. It seems proper, too, to suggest that this story be tied in with some commentary on the non-failing and safe local supply, which has for so long and too generally been just taken for granted.

"What is behind the water spigot?"—in Hongkong and Singapore it was flame and famine or surrender.

Merit Appointments

WITHIN a comparatively few days of one another two highly gratifying merit appointments have been made in two important public works departments.

We refer to the appointment of two capable consulting engineers, as noted elsewhere in this issue, to the posts of director of public works. These were Newell L. Nussbaumer, as Buffalo's new director, and James C. Harding, as the new head of the department of public works of Westchester County, N. Y.

The real *news* in these appointments is the fact that both of these practicing engineers were chosen because of their reputations as engineers and acumen as executives—not to overlook the type of personality possessed by each. There was no political angle whatever in these appointments and neither had sought the positions through any other channels.

It is both impressive and encouraging that these two widely separated political subdivisions should have almost simultaneously decided to choose career engineers for these sought-after positions, which are almost invariably filled by appointees who have political backing in one or another form.

The coincidence of these appointments leads us to wonder if there is not a trend indicated in the choosing of managers of public works departments. In this we, like many another, will hope to see this trend develop into standard practice. In any case these recent New York appointments are gratifying and encouraging.

"A Thought for the Day"

IN THE payment of those meager "contributor dividends" which WATER WORKS AND SEWERAGE at intervals distributes to contributing authors, we sometimes receive "thank you" notes which make us think that these small payments are worth while. A recent distribution brought an acknowledgment which has made us "stop, look and listen," so to speak. It has started us looking at our markedly increased personal tax with a new slant. The letter in question follows. We think it has much food for thought.

Dear Mr. Enslow:

Please accept my tardy acknowledgment of the welcome addition to my exchequer. Every source of income is welcome in these days when we face the present increased income tax inroads on our dwindling pittance.

Sometimes, if we kid ourselves, we can take some of the sting out of life. The recent exploits of Lieut. McDowell and his mosquito boats have greatly appealed to me, and at breakfast a few days ago my daughter, knowing of my admiration of these exploits, reminded me during a discussion of income tax payments that my taxes for this year would just about pay McDowell's salary, so I am kidding myself that he is on my payroll and taking a little reflected glory and satisfaction from his accomplishments.

Of course, I do not know the young man from Adam, but I know the type. I think we will hear a great deal more from youngsters of this type. Evidently it makes no difference to him whether he gets a Jap transport or an attacking bomber. I suppose if a battleship went after him he would be equally ready to turn on them and give them Walter Winchell's toast to the Jap Navy, "Bottoms Up." If he is successful in sinking a battleship, I suppose I will have to raise his pay next year, but it would be worth it.

Very truly yours,

Hackensack, N. J.
January 29, 1942.

E. B. MALLORY.

Mr. Mallory's note, we hope, will interest the reader as much as it has the writer. We hope too that it may stimulate many to view the extra cost to each of us with a bit of Mallorian philosophy.

And why can't each of us find for himself a McDowell for the duration?

L. H. Enslow

Does BECKMAN pH CONTROL Pay?

Does it!

Read What Happened at Chicago!

TRIAL
Sometime ago the Sanitary District of Chicago made a trial installation of Beckman Automatic pH Control in their large Stickney Plant. Months of rigid testing proved, conclusively, that Beckman pH Control makes important savings in chemicals, increases plant efficiency, reduces waste!
REPEAT!
So profitable was the initial Beckman installation, that the Sanitary District ordered a second Beckman Automatic pH installation for its Calumet Plant to control pH of the treating operations there.
REPEAT!
And now the District has ordered a THIRD Beckman Automatic pH installation for still another location in their large municipal system. There's no mistaking conclusive evidence like that!

When the Sanitary District of Chicago made its first BECKMAN pH installation in its Stickney plant, it was frankly skeptical. So the Beckman unit was installed on an out-and-out trial basis. It was subjected to one "shake-down" test after another by District engineers, and the savings it made possible were watched with a cold, analytical eye. *The result?* . . .

. . . Chicago's first Beckman installation proved so successful that it made a *second* in another plant to replace a competitive glass electrode pH outfit that had proved unsatisfactory . . . and has now ordered a THIRD for still another location. *Clear-cut evidence like that tells its own story!*

WHAT ABOUT YOUR PLANT?

Large *or small,* Beckman Automatic pH Control can make *important* savings in YOUR sewage treating plant . . . can save chemicals . . . can increase efficiency and uniformity of operation . . . *and can reduce costs!* Find out about Beckman pH Control *today.* Our research staff will be glad to make recommendations to fit your particular problem.

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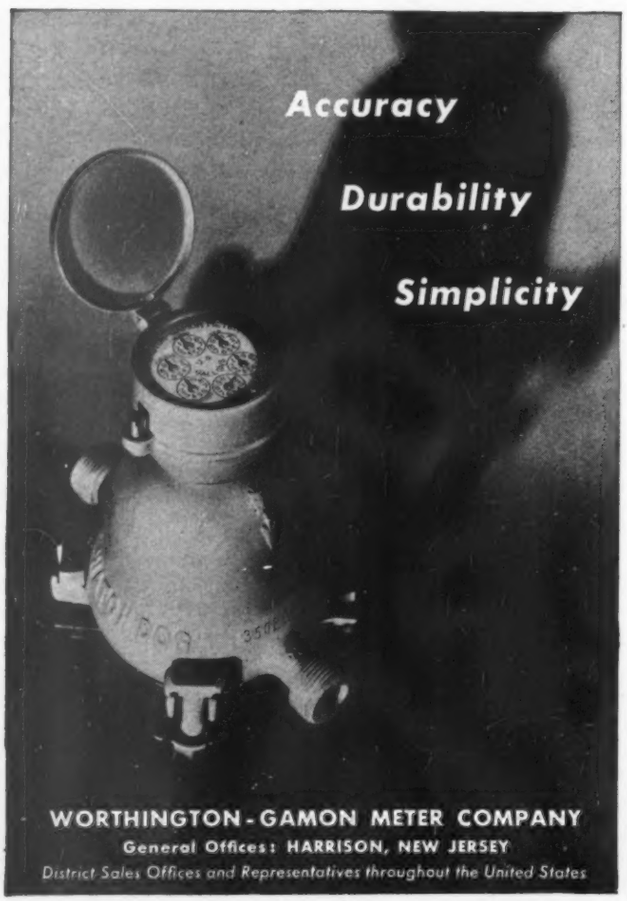

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MEETINGS SCHEDULED

Feb. 19—BOSTON, MASS. (Hotel Statler)
New England Water Works Association. (Monthly Meeting) Secretary, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Feb. 27—READING, PA. (Hotel Abraham Lincoln)
Pennsylvania Water Works Operators' Association (Eastern). Sec'y-Treas., I. M. Glace, 22 South 22nd St., Harrisburg, Pa.

Mar. 5-6—TRENTON, N. J. (Stacy Trent Hotel)
New Jersey Sewage Works Association. (27th Annual Meeting.) Sec'y, John R. Downes, Plainfield, N. J.

Mar. 11—WILKINSBURG, PA.
Pennsylvania Water Works Operators' Association (Western). Sec'y-Treas., I. M. Glace, 22 South 22nd St., Harrisburg, Pa.

Mar. 19—BOSTON, MASS. (Hotel Statler)
New England Water Works Association. Secretary, F. J. Gifford, 613 Statler Bldg., Boston, Mass.

Apr. 2-4—COLUMBIA, MO. (Univ. of Missouri)
Missouri Water Works Short Course. W. W. Towne, Ass't Prof., Dep't Civil Engineering, University of Missouri, Columbia, Mo.

Apr. 9-10—LAFAYETTE, IND. (Purdue Memorial Bldg.)
Indiana Section A.W.W.A. Sec'y, H. G. Horstman, Supt., Water District, Public Service Co. of Indiana, Traction Terminal Bldg., Indianapolis, Ind.

Apr. 13-15—FAYETTEVILLE, ARK. (Engineering Bldg. Univ. of Arkansas)
Arkansas Water & Sewage Conference. (12th meeting.) Secretary, Harrison Hale, 114 Chemistry Bldg., Fayetteville, Ark.

Apr. 15-17—NIAGARA FALLS, ONT. (Gen. Brock Hotel)
Canadian Section A.W.W.A. Sec'y, Dr. A. E. Berry, Director, Ontario Dept. of Health, Parliament Bldg., Toronto, Ont.

Apr. 20-22—SAVANNAH, GA.
Southeastern Section A.W.W.A. Sec'y, A. P. Rice, Supervising Engr., Reconstruction Finance Corp., Bond Service Div., Atlanta, Ga.
(Savannah Meeting cancelled. Conference may be scheduled for some other location.)

Apr. 30-May 1—NIAGARA FALLS, N. Y. (Hotel Niagara)
New York Section A.W.W.A. (Spring Meeting.) Secretary, R. K. Blanchard, Neptune Meter Co., 50 West 50th St., New York, N. Y.

May 6—WALLA WALLA, WASH. (Marcus Whitman Hotel)
Pacific Northwest Sewage Works Assn. Sec'y-Treas., Fred Merryfield, Assoc. Prof. C. E., Oregon State College.
Corvallis, Ore.

(Meeting jointly with)

May 7-9—WALLA WALLA, WASH. (Marcus Whitman Hotel)
Pacific Northwest Section A.W.W.A. Sec'y, Fred Merryfield, Assoc. Prof. Civil Eng., Oregon State College, Corvallis, Ore.

*May 14-15—TOLEDO, OHIO
Ohio Section, A.W.W.A. Sec'y, Thomas R. Lathrop, 2328 Arlington Ave., Columbus, Ohio.

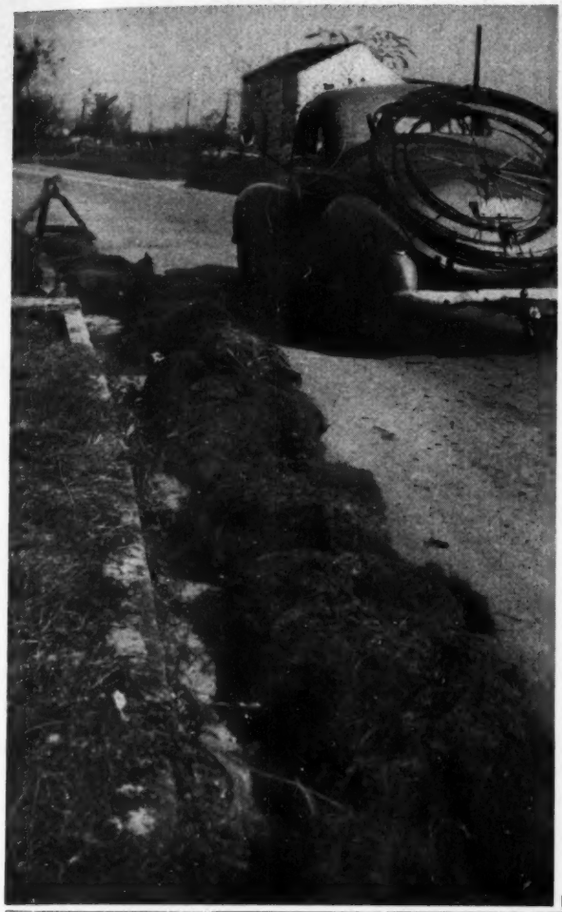
* (Note change in date from previous listing.)

May 15—KENNETT SQUARE, PA.
Pennsylvania Water Works Operators' Ass'n. Sec'y, I. M. Glace, 22 South 22nd St., Harrisburg, Pa.

(Meeting jointly with)

Southeastern Penna. Sewage Works Operators' Ass'n. Sec'y, Gordon J. Wiest, Sewerage Authority, Chester, Penna.

(Continued on page 74)



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Here are the simple facts about this job:

1. Every tool used was carried by our salesman in the automobile shown.
2. The line was 24 in. pipe.
3. Our man broke off the tap roots and pulled 8,000 lbs. of roots to the man-hole.
4. He removed them by cutting off 500 lb. chunks and tied a rope to them. Five men pulled the roots to the surface.
5. Write for full details on this unusual Ohio job.
6. FLEXIBLE equipment can do your job faster and at lower cost.

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Alabama Ordnance Works, Childersburg, Alabama
Camp Crowder, Neosho, Mo.
Camp Haan, California
Chrysler Corporation, U. S. Tank Arsenal, Detroit, Mich.
Denver Ordnance Plant, Denver, Colorado
Des Moines Ordnance Plant, Des Moines, Iowa
Ellyson Field, Pensacola, Florida
Fort Dix, New Jersey
Hercules Powder Company, Radford, Virginia
Indiana Ordnance, du Pont Smokeless Powder Plant, Charlestown
Jayhawk Ordnance Plant, Baxter Springs, Kan.
Kankakee Ordnance Plant, Elwood, Indiana
Martinsville Nylon Plant, du Pont Company, Martinsville, Va.
Navy Operating Base, San Diego, Cal.
Okla. Ordnance Plant, Pryor, Okla.
Quonset Point, Maryland
Remington Small Arms Plant, Lake City, Missouri
San Luis Obispo Camp, California
Tenn. Valley Authority, U. S. Nitrate Plant No. 2
U. S. Government Official Project, Largo, Florida
Volunteer Ordnance Plant—Chattanooga, Tenn.
Welden Springs Ordnance Plant, Welden Springs, Missouri
Western Cartridge Company, East Alton, Illinois

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In Canada
Control and Metering
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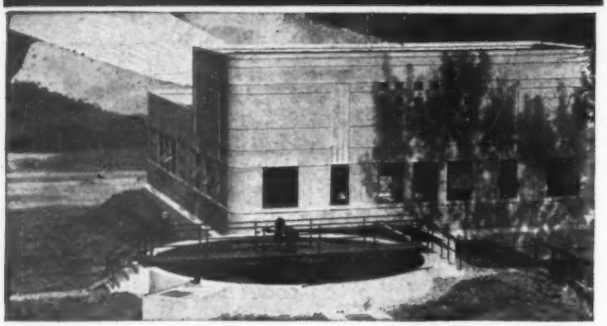
THE *BEST* SPEEDS DEFENSE



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Yesterday it was *wise* to get the best as fast as possible. Today it's a national duty. Insist on INFILCO for all water treatment.

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Sewage-Treatment Works

Administration and Operation

By C. E. KEEFER
Bureau of Sewers, Baltimore, Maryland

673 pages, 6 x 9, 177 tables, 167 diagrams, charts, graphs, and illustrations, $6.00

This practical manual comprehensively presents the problems of administration, operation, maintenance and design of sewage-treatment plants, and how to handle them.

Drawing upon actual operating results and experience obtained at a large number of outstanding sewage works, this book covers sewage treatment in a thorough and practical manner—from characteristics and composition of sewage, through the various stages of treatment, to its eventual disposal.

Its 32 fact-packed chapters present facts about quantity and composition of sewage from institutions, municipalities and industrial plants in considerable detail to facilitate sewage analysis and application of proper treatment process. Modern apparatus and new methods developed over recent years are discussed in detail for the first time in any book.

Water Works & Sewerage
330 South Wells St., CHICAGO
155 East 44th Street, NEW YORK

288-D

MEETINGS SCHEDULED

June 18-19—MINNEAPOLIS, MINN. (Nicollet Hotel)
Central States Sewage Works Association. (15th Annual Convention.) Sec'y-Treas., E. J. Beatty, 458 State Office Bldg., Madison, Wis.

(Note the change in schedule of this meeting from October in the past to June henceforth. This year the dates were purposely chosen to immediately precede the A.W.W.A. Convention, which is to be held in Chicago, June 21-25, with a day for fishing in between.)

June 21-25—CHICAGO, ILL. (Stevens Hotel)
American Water Works Association. (62nd Annual Convention.) Executive-Secretary, Harry E. Jordan, 22 East 40th St., New York, N. Y.

Aug. 24-26—STATE COLLEGE, PA.
Pennsylvania Water Works Operators' Ass'n. (Annual Meeting.) Sec'y, I. M. Glace, 22 South 22nd St., Harrisburg, Pa.

Aug. 26-28—STATE COLLEGE, PA.
Pennsylvania Sewage Works Operators' Ass'n. (Annual Meeting.) Sec'y, Bernard S. Bush, State Dept. Health, Harrisburg, Pa.

Sept. 9-11—TRAVERSE CITY, MICH. (Park Place Hotel)
Michigan Section, A.W.W.A. Sec'y, M. N. Gerardy, Sup't Water Supply, Water Board Bldg., Detroit, Mich.
(Meeting jointly with)
Michigan Conference on Water Purification. Sec'y, R. J. Faust, Dep't of Health, Lansing, Mich.

Sept. 15-18—POLAND SPRING, ME. (Poland Spring House)
New England Water Works Association. Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Oct. 12-15—
Southwestern Section A.W.W.A. Secretary, Lewis A. Quigley, City Water Works, 3320 W. Berry, Fort Worth, Texas.

Oct. 15-17—CLEVELAND, OHIO (Hotel Statler)
Federation Sewage Works Association. (3rd Annual Convention.) Sec'y, H. W. Wisely, Urbana-Champaign Sanitary District, Urbana, Ill.

Oct. 15-17—CLEVELAND, OHIO (Hotel Statler)
Ohio Conference on Sewage Treatment. (Meeting with Federation of Sewage Works Associations). Sec'y-Treas., W. D. Sheets, 568 E. Broad Street, Columbus, Ohio.

Oct. 22-24—ST. LOUIS, MO. (Coronado Hotel)
Missouri Valley Section, A.W.W.A. Sec'y, Earle L. Waterman, 104 Engineering Hall, University of Iowa, Iowa City, Ia.

Oct. 28-30—LOS ANGELES, CALIF.
California Section, A.W.W.A. Sec'y, H. Arthur Price, Dept. Water and Power, 316 West 2nd St., Los Angeles, Calif.

Nov. 2-4—DURHAM, N. C.
North Carolina Section, A.W.W.A. Sec'y, R. S. Phillips, Chief Chemist, Water Department, 206 Dacian Ave., Durham, N. C.

LITERATURE AND CATALOGS

Graver Water Conditioning Equipment is described in a series of loose-leaf data sheets recently received at this office. Of special interest is the discussion of aeration and the description of three types of gravity aerators—Coke Tray, Baffle Plate, and Raschig Ring—and the Diffuser Type of pressure aerator. Most general in application is the Coke Tray Aerator, consisting of a series of fir or cypress wood trays supported on a non-corrosive screen. Water leaving the trays falls into a collector pan from which point it can flow directly to a filter plant or be discharged into a settling basin. The Baffle Plate Aerator, designed principally for removal of carbon dioxide, consists of a closed tank containing a series of baffles by means of which water is dispersed into finely divided particles and aerated in a current of rising air. In the Raschig Ring Aerator, water is allowed to seep through narrow voids in a bed of small, hollow, ceramic rings. The Diffuser Type Aerator is essentially a cylindrical chamber filled with graded gravel in which the water comes in contact with air under pressure. A Taste and Odor Removal filter is shown as a two-compartment tank, the upper compartment filled with sand removing all suspended matter and the lower filled with activated carbon, eliminating taste and odor. Also described in the series is the Graver Oil Removal filter, featuring an especially processed mineral which absorbs emulsified oil; and the Graver Steel Strainer for the removal of foreign matter from any fluid supply. Complete specifications, dimensions, and capacities are given with each data sheet. For information on any of the above equipment write to Graver Tank and Manufacturing Co., Inc., East Chicago, Ind.

"Dresser Industries in National Defense and Civilian Service" is the title of a handsomely illustrated brochure telling what this large manufacturing concern and its subsidiaries are doing in our country's service. Activities of the Dresser plant at Bradford, Bryant Heater Company at Cleveland, Clark Brothers at Olean, and Pacific Pump Works at Huntington Park are described almost exclusively by photographs. The part Dresser industries are playing in maintenance of

(Continued next page)

Waterworks men are using

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During the past six years, the amounts of Hydrodarco used by waterworks men have shown a tremendous increase. The volume for 1941 was more than five times the amount for 1936!

What does this growing popularity prove? It proves that in these days, waterworks men are more interested in carbon performance than in claims. Impartial performance tests show that Hydrodarco delivers maximum palatability control per dollar, right in your own plant. Compare . . . and you'll be convinced that while Hydrodarco may be a little higher in price, the results are more than worth the difference.

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Hydrodarco — Reg. U. S. Pat. Off.

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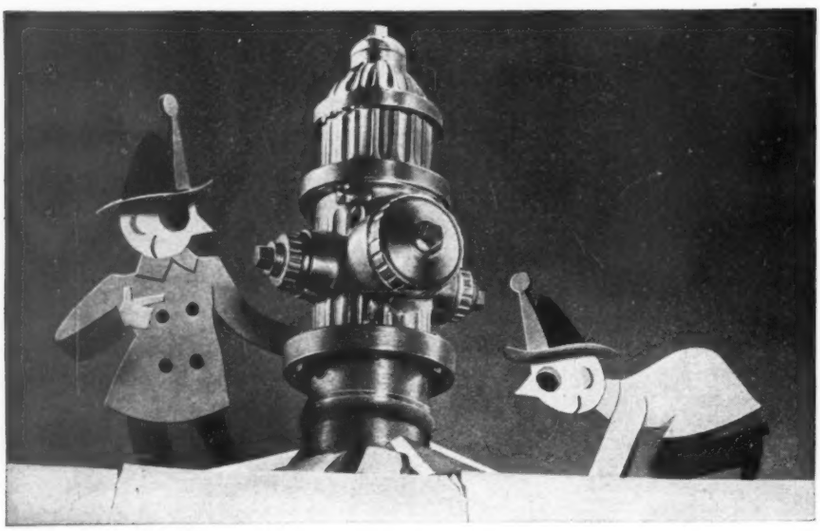
vital gas, oil, and water services is emphasized. For a copy of this purely informative brochure write to the Dresser Manufacturing Co., Bradford, Pa.

A New Laboratory Equipment Catalog—By Phipps and Bird, Inc., "Southern Center for Laboratory Apparatus and Chemicals," is now ready for distribution. It is most complete ever produced by this laboratory supply house. Some of the features of interest and convenience of users of the new catalog are the following: Most of the illustrations have been placed along the outside edges of the page, with item number shown in bold type. Short descriptions, added wherever needed, are employed to preclude the possibility of confusion. To render location of any item simpler and easier, a four-way scheme of indexing is employed—(1) by alphabetical arrangement, with a page index at the outside upper corner of each page; (2) by grouping important apparatus for certain types of analyses; (3) a special separate index covering all ASTM materials; (4) the general index on colored stock in the back. A type of cross referencing is employed throughout the catalog, in order to guide the user easily to other pages on which similar or allied equipment and supplies are to be found. All laboratory items manufactered by Corning, Kimball and Coors are completely listed. Any reader responsible for procurement of laboratory equipment and supplies should have a copy of this easy to use catalog. Write Phipps and Bird, Inc., Richmond, Va.

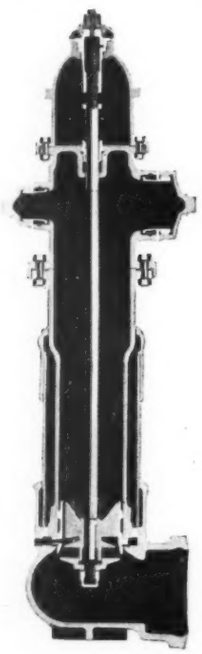
Removal of Lime-scale Deposits from Water Meters, undergoing repairs or reconditioning is one of the uses of Oakite Compound No. 32, explained and illustrated in a newly revised third edition of the "Oakite Manual." Meters are dismantled and parts immersed in a suitable vessel containing the proper solution of the compound at room temperature. The Oakite product, although of an acidic nature, is said to be much safer in handling and to have hardly any harmful effect on steel, bronze or brass. Other advantages claimed for the product are its economy, its quick action, and its applicability to a large variety of water scales. It also is recommended for condensers, refrigerating equipment, and other cooling systems. A copy of the manual can be obtained by writing to Oakite Products, Inc., 57 Thames Street, New York, N. Y.

Air for Defense—is the caption on a new folder from Schramm, Inc., of Westchester, Pa., which presents in picture and brief description the numerous styles and models of air compressors and allied units manufactured by this well known firm. This particular folder reveals the piece of equipment and presents a brief description of its place in defense and emergencies in general. For a copy write Schramm, Inc., Westchester, Pa.

"Factors Governing Truck Tire Service" is the timely subject discussed in a 15-page section of the new B. F. Goodrich Company "Operator's Handbook." Charts and tables tell the value of proper inflation and loading, and indicate the danger and inefficiency of over- and under-inflation, mis-matching of dual tires, bleeding of heated tires, and truck operation at excessive speeds. Causes of uneven tire wear are thoroughly explained. At the close of this section the important facts are summarized in 20 practical rules for operators. The remainder of the



28" OF FROST IN THE GROUND
BUT OUR MATHEWS NEVER BUDGED



Everybody knows that ground swells when it freezes. But Mathews is the only hydrant designed to prevent that swelling ground from heaving the hydrant loose from its water main. The Mathews Hydrant has a loose protection case which is free to rise and fall without putting any strain on water carrying parts. If you face cracked or leaky hydrants this spring, investigate Mathews. This same protection case allows the barrel, containing all working parts, to be changed like a spare tire for repair, overhaul, or modernization.

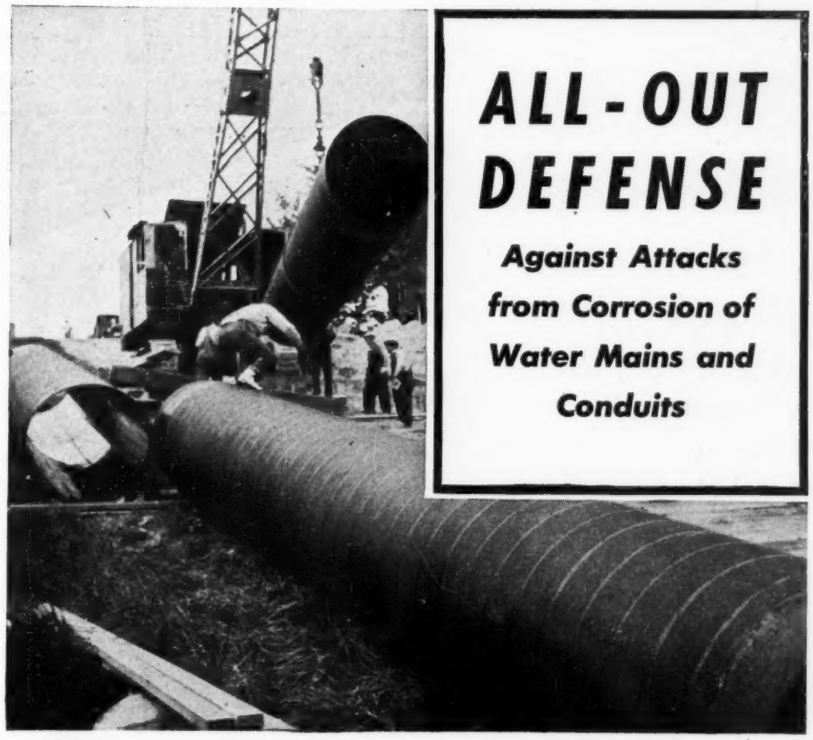
MATHEWS HYDRANTS
Made by R.D. WOOD Company
400 CHESTNUT STREET, PHILADELPHIA, PA.
ESTABLISHED IN 1803

handbook contains a wealth of material about tire sizes and dimensions, recommended loads at various pressures, and specifications of Goodrich products. A copy of the "Truck Operator's Handbook" can be obtained by addressing The B. F. Goodrich Company, Akron, Ohio.

The Paint Selector—is a novel and handy means of selecting the best paint, without detailed technical study of properties of all finishes that might be suitable for a given application. The Valdura Paint Selector, issued by American-Marietta Co., of Chicago, makes conveniently available all information on properties of, and all application data necessary, to choose properly from 43 paint, enamel and varnish products. Two charts are embodied in the Selector. Fifty-one divisions on the first chart list all types of surfaces that might be encountered in industrial, commercial and residential painting, and under which are listed one or more paints suitable for the application. A second chart gives all properties of each paint, to facilitate selection of the finish most suitable when a choice is offered by the first chart. Information included is whether the finish may be used under water or over graphite paint; maximum heat resistance in degrees F.; relative resistance to alkalies, acids, moisture, abrasion, sun and oil; coverage, and drying time. The chart also lists the most suitable thinner and primer for each type of paint. For a copy of this novel folder write American Marietta Co., 43 East Ohio St., Chicago.

"Rotomatic" is Fischer and Porter's new system of flow control by means of automatic pneumatically-operated controllers, remote recorders, and standard indicating rotometers. Features and applications are discussed in Section 51-B of the F-P catalogue now being released section by section. The "rotomatic," valuable for controlling and recording flows of caustic and organic fluids, has all advantages of the standard rotometer plus completely automatic flow control. Meters are furnished with indicating-controlling, recording-controlling, or recording-indicating-controlling features. Hookup of rotameter, pneumatic valve, recording-controlling instrument, bypasses and valves are shown in a flow diagram indicating wiring as well as process and air piping. A final page lists information that is required in ordering flow controllers. For a copy of Catalogue Section 51-B write to Fischer and Porter Company, 54 County Line Road, Hatboro, Pa.

Coleman pH Electrometers, for the measurement of hydrogenion concentration are featured in a new bulletin, titled "New Instruments for a Modern World." Standard models "3," including two types for use with the Coleman spectrophotometer, research models "4," and the industrial pH tester, model "15," are illustrated and described in detail. For great accuracy with a standard electrometer the model 3D, equipped with automatic temperature compensator and redox electrode, is recommended. The instrument gives instant readings of pH over the range of 1-13 by 0.1 pH divisions, or over 0-1300 millivolts by 10 millivolt divisions, but further readings down to .02 pH or 2 millivolts can easily be taken. Other Coleman equipment described in the bulletin includes the "continuous flow electrode assembly," the micro titration assembly, and the model 16 simplex titrimeter. The titrimeter, used for



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REILLY cold application protective coatings give economical protection to tanks, stacks, structural steel and other exposed metal—also to metal for underground or underwater service. *Write for descriptive literature.*

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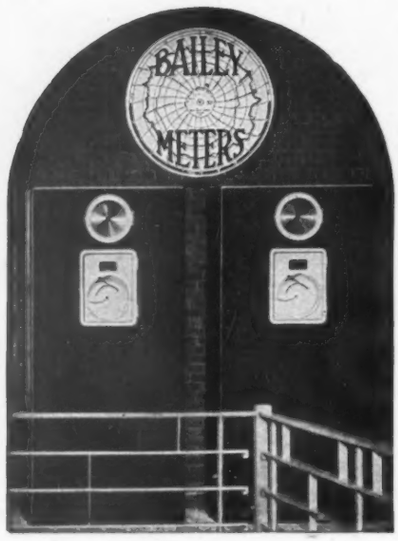
determining the end points of oxidation-reduction titration, consists of a battery-operated electron voltmeter of variable sensitivity. Prices of all instruments and spare parts are listed. In writing, ask for Bulletin 104, from the Wilkens-Anderson Company, 111 North Canal Street, Chicago, Ill.

"The Texrope Super-7 V-Belt," described and illustrated in Allis-Chalmers new 8-page bulletin No. B-6190, bases its increased strength and longevity on four new factors of design. The new belt contains 20 per cent more cords, which are in turn said to be 50 per cent stronger than the cords in previous Texrope belts because of a new "flexon" process. Cords float on an especially designed rubber compound that absorbs shocks, and a "duplex-sealed" two-ply cover protects the outside of the belt. The bulletin contains tables showing the recommended V-Belts for various motor speeds and sizes. For a copy of Bulletin B-6190, write to Allis-Chalmers, Milwaukee, Wis.

"Training Oxy-Acetylene Welding and Cutting Operators—Instructors' Outlines" is a new 88-page book prepared by the International Acetylene Association to assist instructors in oxy-acetylene welding and cutting. The text is divided into three chapters. The first is devoted to the training course for general welding, aircraft welding, and pipe-welding operators. Essential information for training cutters is outlined in the second part; the final chapter gives important data on the course for inspectors and primary requirements for taking the inspectors' course. Each self-contained unit presents an outline for classroom lectures, suggestions for study assignments, recommendations for material to be demonstrated and discussed, and a description of practice exercises the student should do in the shop. An introduction describes the organization of the book, and gives suggestions for its use. Paper-bound copies of the book are being distributed for 25 cents each, and a deluxe cloth-bound edition for 75 cents. For a copy write to the Secretary of the International Acetylene Association, 30 East 42nd Street, New York, N. Y.

Cochrane-Becker Condensate Return Systems are described and illustrated in a late 4-page bulletin, No. 3025. A typical installation of the Cochrane Corporation is diagrammed showing the seam, condensate, and make-up lines in contrasting colors.



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Regardless of whether your problem calls for the use of a Venturi Tube, Weir, or Flume, you can depend on Bailey Meter Company to design and construct both the primary element and the register for maximum accuracy.

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No small share of the accuracy and reliability of Bailey Meters is due to the conservative engineering policy of the Company. New ideas and designs are not offered for sale until they have been thoroughly tested both in the laboratory and in actual service.

Bailey Meters, Recorders and Controllers present a thoroughly modern yet conservative appearance.

Write for your copy of Bulletins No. 301 and 302, describing Bailey Fluid Meters for steam, liquids, gases, sewage, sludge, and compressed air.

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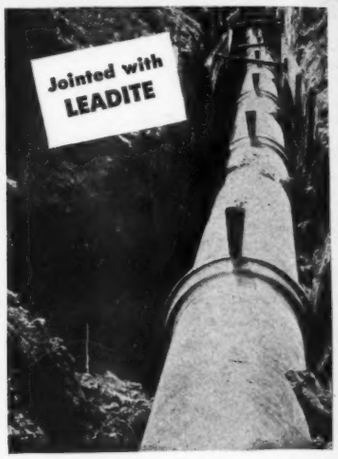

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Engineers and water works men know LEADITE . . . choose it because it makes a good, tight, *lasting* joint . . . saves time and money.

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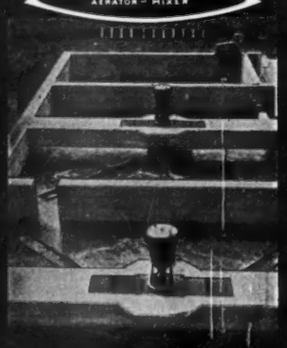

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Another drawing illustrates the jet-loop principle on which the system operates. The system features a completely closed circuit, which is said to result in positive removal of condensate, elimination of entrained air, and return of condensate to boiler at close-to-process temperature. The C-B systems are currently in use in 50 different industries, including numerous chemical processing plants. Detailed specifications of the system are listed. Copies of Bulletin 3025 may be had by writing to Cochrane Corporation, Philadelphia, Pa.

EQUIPMENT NEWS

Portable Ozonator

• A portable, automatic ozonator has been developed by the Technicraft Engineering Co. of Los Angeles. The new unit, known as the "Sterozone" Model B, has a capacity in excess of 1200 gallons per hour and can be installed on any tank or water storage container. For field use a 250-gallon canvas bag is used. Power is supplied from 110-volt, 50-60 cycle outlet or by a portable gasoline-electric generator. Operation is entirely electrical, no chlorine or other chemicals being employed.

The sterilizing agent employed is ozone generated by the silent electrical discharge maintained at 11,000 volts. Injected directly into the water passing through the unit, the ozone completely oxidizes bacterial contamination and produces pure, clear, colorless, odorless, tasteless water. "Sterozone" treatment of chlorinated water will also remove objectionable tastes and odors produced by overtreatment. Because of the sim-

(Continued next page)

Now more than ever Sludge will be needed for Fertilizer!

Because many of the process industries normally producing fertilizers are occupied with defense production and because increased demand for food stuffs and for agricultural products to supplant former sources of vegetable oils calls for maximum acreage yields, *sewage sludge will be needed more than ever for fertilizer.*

Many cities cognizant of the need, have equipped their sewage treatment plants with Royer Sludge Disintegrators. Beside eliminating the cost of burial or incineration, they are realizing a profit on the sale of the Royer-prepared sludge and rendering an invaluable service to farmers, florists and orchardists as well as cemetery and park caretakers and golf course greenskeepers.

Indications are that *all of the sludge America's sewage plants can produce will be needed* and the Royer makes it available for use quickly and at the lowest cost per ton. Twelve stationary and portable models — electric, gasoline and belt-to-tractor drive — a model for every plant.

THE ROYER

Send for portfolio of data on fertilizing value of sludge, its preparation, etc., by some of the most eminent authorities on the subject.

ROYER FOUNDRY & MACHINE CO.
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WATER FOR A NATION AT WAR!

To the East and to the West, we are looking straight into the cannons of war. From within we face the inevitable saboteur. It is time to become grim, cautious and determined in our war aims and actions. We must win this war and do a good job of it. We will fight with men, metals, fuel, power, food, water and materials of all kinds.

Never before has water been a more vital necessity. Beyond its task of serving men, materials and machines, water now also must guard against fire . . . protect factories, equipment, supplies, homes . . . and lives.

As in the strenuous days of defense preparation, Layne now is ready, fully equipped and speedily engaged in an even greater task . . . that of providing water for a Nation at war. This activity includes service to the Military and Naval forces, essential industries and necessary repair work.

Check your water supply and install necessary wells and pumps. See that all present wells and mechanical equipment are placed in good order and kept ready for any emergency. Repairs to existing equipment will conserve material needed for war purposes.

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Memphis, Tenn.

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PUMPS & WELL
WATER SYSTEMS

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Layne-Northern Company.....Mishawaka, Ind.
Layne-Louisiana Company.....Lake Charles, La.
Layne-New York Co.....New York City.
Layne-Northwest Company.....Milwaukee, Wis.
Layne-Ohio Company.....Columbus, Ohio
Layne-Texas Company.....Houston, Texas.
Layne-Western Company.....Kansas City, Mo.
Layne-Western Co. of Minn.....Minneapolis, Minn.
Layne-Bowler New England Corp...Boston, Mass.
International Water Supply, Ltd...London, Ont.

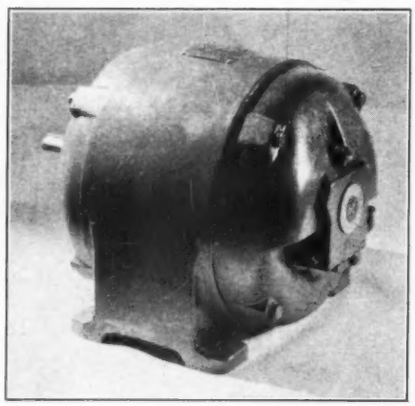
WORLD'S LARGEST WATER DEVELOPERS

plicity and efficiency of the "Sterozone" Model B unit, it has wide and varied applications.

Model B "Sterozone" is claimed to be ideally suited for water purification on farms, ranches, construction camps and all rural localities. Breweries, dairies, laundries, bottling plants and all process industries which must have purified water can be supplied.

A complete description of the "Sterozone" Model B, together with results of Health Department laboratory tests of water treated by the unit, is available from the manufacturer. Technicraft Engineering Co., 5610 South Soto St., Los Angeles, Calif.

New A-C "Lo-Maintenance" Motor



● "The greatest motor improvement in years" is how Allis-Chalmers describes the "Safety-Circle" protection of its new "Lo-Maintenance" Motors. Specailly developed to give the motor complete all-round protection, the "Safety-Circle" is a wide and solid rib. Integrally cast as part of the frame, it forms an unbroken circle of protection around the stator.

All the experience of building motors for over fifty years has been concentrated in the development of this advanced product. One-piece cast frame and cast end-shields guard the motor from exterior knocks and abuse. A more liberal use of electrical materials makes this motor internally and electrically stronger because current and magnetic densities are less extreme. Improved bearing design delivers smoother performance with full-flow lubrication and easier maintenance. Additional cross strength has been built into the distortionless stator for maximum power efficiency. Rotor is keyed to the shaft for strength, and its outer surface is turned for smoothness and an accurate air-gap. Other "Lo-Maintenance" features are oil drains at bottom of bearings for easy flushing, removeable end-pieces, and large conduit box for handy wiring.

For a descriptive folder, write Allis-Chalmers, Co., Milwaukee, Wis.

THE LINING IS IMPERVIOUS — THE JOINTS ARE LAPPED

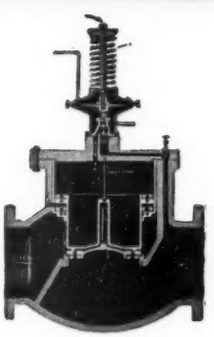
LIPCo
CEMENT LINED PIPE

AVAILABLE *Now!*
Immediate DELIVERY
ON
STEEL, TONCAN IRON
AND WROUGHT IRON

Cement Lined Service Pipe

CEMENT LINED PIPE CO.
Lynn, Mass.

Stop Check
Single Acting
Altitude Valve



This valve installed in the upstream line automatically maintains a uniform water level within 3" to 12" variation to prevent any tank overflow; also, by means of the internal "stop check" piston assembly, prevents loss or return of storage water back through the valve—making the valve very desirable for use where metered water is purchased, or wherever it is imperative that there be no possible return flow.

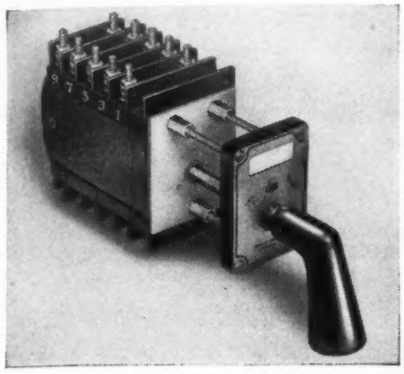
This valve may be fitted with "Differential" Control for delayed opening, if desired.

Write for specifications and prices.

GOLDEN-ANDERSON
VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

New Rotary Type Control Switch

• A new double-break, direct-acting rotary switch for the control of circuit breakers has been developed by the Roller-Smith Co., Bethlehem, Pa. The switches are insulated for 600 volts and have a continuous current carrying capacity of 10 amperes.



This switch is built up of units, each unit consisting of two single break contacts connected in series by means of a jumper. The switch has a spring return arrangement so that when the handle is released the switch returns to the "OFF" position, opening the contacts. The handle is of the pistol grip type, facilitating operation of the switch.

A red and green target is furnished as a part of each switch to indicate the last position of the switch. For example, to operate the circuit breaker control switch in conjunction with indicating lamps, the switch is turned to the "CLOSE" position, 45° clockwise. This operation closes the breaker and energizes the red lamp through a breaker auxiliary switch. When the handle is released, the spring return feature causes the switch to return to the "OFF" position, opening the contacts. The red target shows that the last position was to close the breaker.

To trip the breaker, the switch is turned to the "TRIP" position, 45° counter-clockwise. This brings up the green indicator and lights the green lamp through another auxiliary switch.

If the breaker trips by some means other than by the switch the green lamp and the red target are seen at the same time. This indicates that the breaker tripped on some fault.

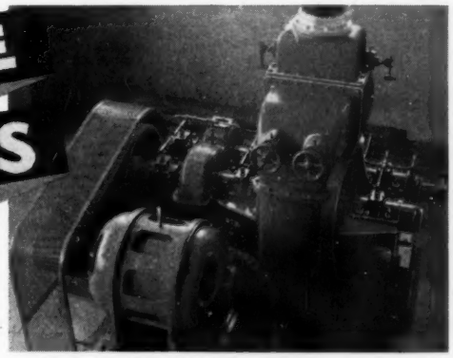
Illustrated Catalog 7140 effectively, describes the new Rotary Control Switch; for a copy, write the Roller-Smith Co., Bethlehem, Pa.

BUILDERS VICTORY VENTURI

Sewage and Air Meters, installed on many Army and Navy projects, are doing their share in maintaining healthful living conditions for our boys who are serving "Old Glory."

BUILDERS - PROVIDENCE, INC.
(DIVISION OF BUILDERS IRON FOUNDRY)
PROVIDENCE . . . RHODE ISLAND

POSITIVE BLOWERS Cut AERATION COSTS

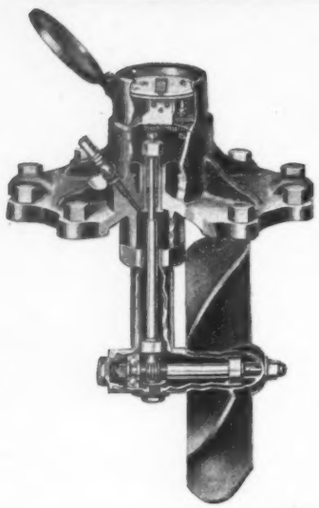


Roots-Connersville Rotary Positive Blowers waste no power, as pressure developed always balances resistance to be overcome. Volume of air delivered is readily controlled by use of multi-speed motors, by blowers of dual impeller design as in Massachusetts sewage plant shown above), or by a combination of both methods where a wide variation in volume is desired.

Roots CONNERSVILLE BLOWER CORPORATION
202 MOUNT AVE. CONNERSVILLE, INDIANA

ALL OUT for VICTORY

SPARLING
WATER MAIN LINE METERS



The DIRECT ACTION METER

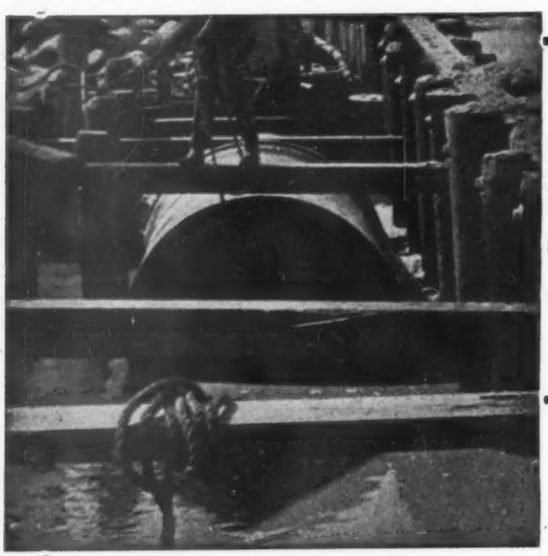
IT takes less than a minute to understand the action of a Sparling Main-Line Meter. The "works" are all shown at left!

Follow the direct action from propeller to totalizer. Indicating and recording instruments are optional equipment.

Bulletin 307 will be sent upon request.

R. W. SPARLING

LOS ANGELES.....Box 3277 Terminal Annex
CHICAGO.....3104 S. Michigan Avenue
622 Broadway.....CINCINNATI
101 Park Avenue.....NEW YORK



84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

75 Federal St., Boston

New Method of Protective Lighting

Elipso Standlites

Angle Style — Direct Style

● Announcement is made by the Goodrich Electric Co. of Chicago of the new Elipso Standlite, which fills a definite need for protective illumination around industrial plants, and conforms with FBI specifications. Due to its elliptical shape, the fixture provides a wide lateral distribution of light. With proper spacing of fixtures, a brilliant barrier of light is created around property lines without illuminating buildings and grounds. Watchmen remaining in the darkness, can instantly spot the entrance of any intruder into the brightly lighted fence or boundary area. With the low mounting height, lamps of from 300 to 500 watts deliver a high intensity of illumination.

The Elipso Standlite is available in the two styles here shown. While the Direct Style delivers light laterally, the Angle Style provides a slight forward throw. Finished in permanent porcelain enamel, entirely weatherproof, the fixtures are easily installed and serviced. They're designed for mounting on a standard two-inch pipe. Catalog sheets may be obtained from the Goodrich Electric Co., 4600 Belle Plaine Ave., Chicago, Ill.

F-M Duplex Sewage Lift Station

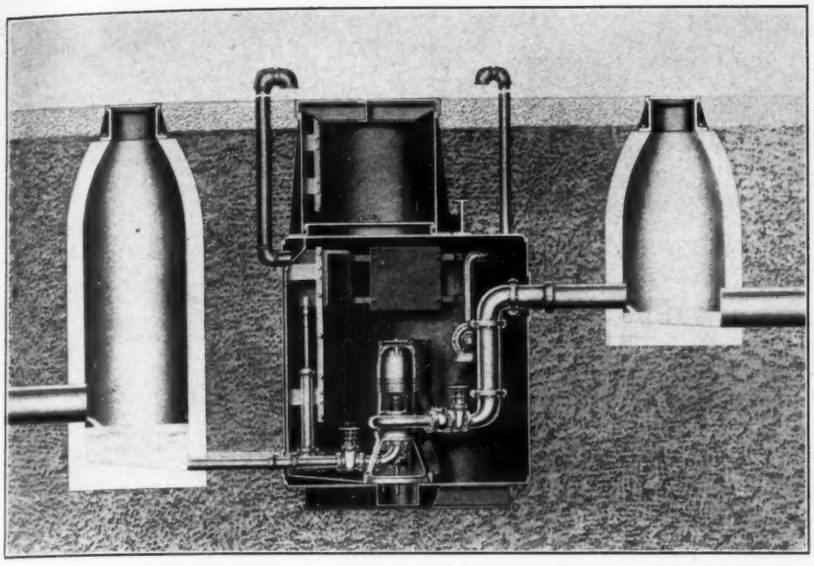
● Especially adaptable for subsurface sewage lift stations are the Fairbanks-Morse Duplex Stations (Fig. 6420), which have been recently installed in U. S. Army Camps.

The arrangement here pictured consists of twin Fig. 5432 close coupled trash type sewage pumps of 4" size, driven by weather proof Type "QZV" 3 H.P. 1200 RPM ball bearing motors. Each unit has a capacity of 325 GPM against a total dynamic head of 22 feet.

In operation, when the water in the receiving manhole on the left reaches certain fixed levels the pumping unit is started and stopped by means of a specially constructed switch. The water enters the pump through the suction pipe to the left of the pump and is discharged up, on the right, to the discharge manhole. Check valves are provided in the discharge line to the right of the pumps to prevent the back flow through the idle pump when only one unit is operating.

Emergency operation controls may be included so that the second pump will start when the water is higher than the level required to start the first pump. Then, if the sewage or drainage comes to the first pump faster than it can be handled, the second pump will cut in and operate in parallel with the first one.

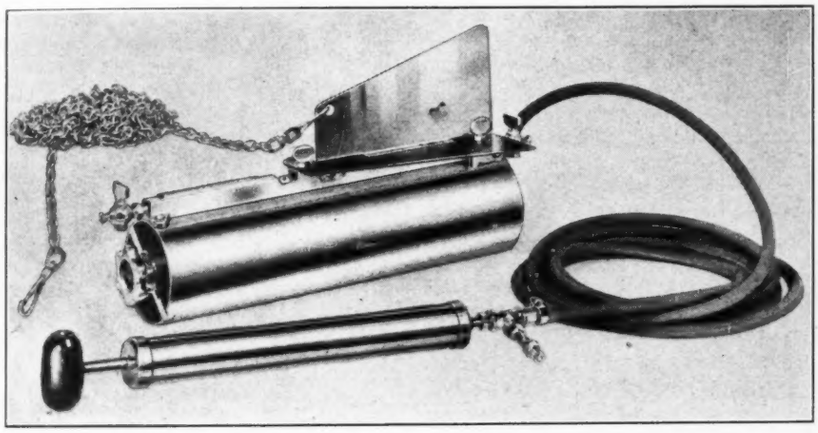
(Continued next page)



The ventilating fan and piping assure a clean flow of air through the station. The pump chamber is easily accessible through the large manhole.

For literature describing the F-M Duplex Lift Station in more detail, write Fairbanks, Morse and Co., 600 South Michigan Ave., Chicago, Ill.

New Sampler for Sewage and Sludge by P. F. T.



● A convenient device known as the P. F. T. Sewage and Sludge Sampler, for sampling still or flowing liquids without disturbing the liquid bodies or contaminating the samples, has been introduced by the Pacific Flush-Tank Co., well known manufacturers of sewage treatment equipment.

The sampler consists essentially of a metal cylinder with an inflatable rubber valve at each end supported at the axis of the cylinder. On the one side of the unit is a sample withdrawal cock and a vent cock.

The sampler can be used in a vertical position, being passed through the well or hand hole of a digester floating cover or septic tank, or it can be used in horizontal position to take a sample from a tank or flowing stream. In the latter case the detachable guide fin is used.

In sampling sludge the valves at both ends, which inflate in unison, are closed and the unit is lowered by means of a chain to the desired depth in the medium to be sampled. The valves are then deflated to allow filling of the cylinder and again inflated to close both ends.

In sampling liquids from tanks, or water from a stream, the sampler is lowered in a horizontal position with both valves open. The liquid is allowed to flow through the cylinder for a few moments and the valves are again inflated, closing both ends of the unit. A hand pump, supplied, is used and air passes to the balloon valves through a rubber hose. After the valves are inflated, the sampler is lifted to the surface and taken to a laboratory or elsewhere for removal of the sample through the draw-off cock.

Construction is simple and rugged. All parts are accessible for cleaning or replacement.

A new bulletin, (No. 133), giving complete details, will be sent on request to the Pacific Flush-Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

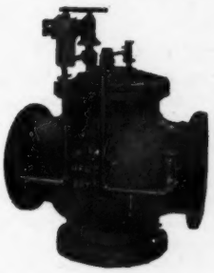
·1879·

ROSS

AUTOMATIC VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.

COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
INCORPORATED
P. O. BOX 595, TROY, N. Y.

HYDRO-TITE

ONE POUND does the work of four pounds of lead. Much easier to use than lead and requires no caulking.

HYDRO-TITE joints are strong, very flexible and tight.

Write for our free trial offer.

HYDRAULIC DEVELOPMENT CORPORATION

MAIN SALES OFFICE - 11 CHURCH STREET, NEW YORK
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OVER 25 YEARS WITHOUT A FAILURE

ODOR and TASTE are health factors-too

THE WATER SUPPLY that pleases nose and palate is an important contribution to community health—people drink more of it.

ESOTOO* is the answer to a simple, sure and more economical method of controlling residual chlorine—especially in "break-point" chlorination.

ESOTOO* is the Ideal De-Chlorinator.

Write for bulletin which describes the "Virginia Method" of applying Liquid Sulfur Dioxide for Dechlorination.

*ESOTOO is "Virginia's" Trade Name for Liquid Sulfur Dioxide.

VIRGINIA

VIRGINIA SMELTING COMPANY
WEST NORFOLK, VIRGINIA

WITH THE MANUFACTURERS

Mathieson Alkali Observing 50th Anniversary

● The Mathieson Alkali Works, Inc., producer of liquid chlorine and other chemicals used in the purification of water and the disinfection of sewage, is this year observing its fiftieth anniversary. The company received its charter in Virginia in 1892.

With plants in Saltville, Va., Niagara Falls, N. Y., and Lake Charles, La., Mathieson is one of the major producers of alkalies, chlorine, synthetic ammonia, and numerous other products. At present, all three plants have been geared to maximum production to supply chemicals vitally necessary to our all out war effort.

Half a century ago, all of the bleaching powder and most of the alkali consumed in this country were still imported from England, and the prejudice in favor of the imported products was strong. To insure a product equally as good, construction and initial operation of the new company's plant were entrusted to a retired English alkali manufacturer, Neil Mathieson. He sent a son, Thomas T. Mathieson, to this country, and under the latter's supervision a plant was built at Saltville, Va., where there are huge and historic salt deposits.

About that same time, Mathieson obtained sole rights to use of the Castner electrolytic cell in America for the manufacture of extremely pure caustic soda and chlorine, and to obtain cheap power, a plant was constructed at Niagara Falls, N. Y. Production began in this plant late in 1896.

Other notable Mathieson accomplishments include the commercial production of synthetic ammonia in 1923; the development of a true calcium hypochlorite as a new chlorine carrier in 1928; the development of sodium chlorite as an improved bleaching agent for textiles, paper, flour, and other materials in 1939; fused alkalies in briquet form for a variety of uses; synthetic salt-cake to replace foreign supplies for kraft paper manufacture; exceptionally pure dry ice and carbonic gas from carbon dioxide, obtained as a by-product from the ammonia soda process at Saltville; especially designed containers for the shipment of liquid chlorine; and the distribution of caustic soda in liquid form in tank cars and in a specially designed sea-going tanker, plying between Lake Charles, La., and Norfolk, Va., where Mathieson operates a liquid caustic storage terminal.

INQUIRIES INVITED on all Problems of WATER TREATMENT

Whether your problem of water rectification is large or small, we have a form of equipment to serve your needs. We manufacture and install equipment for Gravity Filtration and Softening Plants; Pressure Filters and Zeolite Softeners; Swimming Pool Recirculating Appliances; and Water Treatment Units of all types.

ROBERTS FILTER MFG. CO.
607 COLUMBIA AVE.
DARBY, PA.

BEFORE CLEANING — THE NATIONAL METHOD — AFTER CLEANING

CLOGGED PIPES

Made Good as New

THE NATIONAL METHOD OF WATER MAIN CLEANING makes your old pipe practically as good as new. Every department is subject to loss through the ravages of time upon its distribution system. The cleaning out of this foreign matter inevitably leads to increased pressure and flow, improved health conditions, and lowered operating costs.

Our illustrated Booklet, "The Cleaning of Water Mains," will be sent upon request.

NATIONAL WATER MAIN CLEANING CO.
30 Church Street, New York, N. Y.

BRANCH ADDRESSES
205 West Wacker Drive, Chicago, Ill.
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208 E. Forsyth St., Jacksonville, Fla.
3812 Castellar St., Omaha, Nebraska
501 Howard St., San Francisco, Calif.
2028 Union Ave., Montreal, Canada

Oakite Expands Service Facilities

S. C. Shank

T. R. Smith

● To better meet the rapidly increased needs for its services and products by water works in New England and in the Southwest, Oakite Products, Inc., manufacturers of industrial cleaning materials since 1909, has announced the addition of two newly created divisions to its nation-wide field service staff.

The New England Division, with headquarters in Hartford, Conn., is headed by T. R. Smith, newly appointed Division Manager, who will supervise the activities of the eleven men comprising this division. The second new Oakite Division is the St. Louis and Southwestern Division, which will make its headquarters in St. Louis. S. C. Shank has been selected to fill the post as Division Manager and direct the activities of the twelve men of this division.

Both newly appointed Division Managers bring to their new posts a wealth of knowledge and experience in the many essential cleaning operations required in water works maintenance. Mr. Smith has served for the past 16 years as an Oakite Service Representative in a major Eastern industrial area, while Mr. Shank has covered a Mid-Western territory since 1930. In their capacities as Oakite Service Representatives, both men distinguished themselves by cooperating with and rendering technical service to water works in their repective territories on a wide range of cleaning and related work, such as removing lime-scale deposits from water meters before repairing; washing pumping station walls and floors; and safely de-scaling engine cooling systems.

The appointment of Messrs Smith and Shank as Division Managers, follows the long established Oakite policy of promoting deserving men from the ranks to executive positions.

For literature on the applications and effectiveness of Oakite in water and sewage works operations and maintenance, write Oakite Products Inc., 22 Thames St., New York City.

Wabash
DOUBLE LID
METER BOX
COVERS
●

For meter pits where maximum protection against freezing is desired, WABASH Double Lid meter box covers have been first choice of water works men for many years. The Ford Lifter Worm Lock provides maximum convenience for the meter reader. The inner lid and sloping skirt provide maximum frost protection for the meter. ● Wabash Covers are made for 15", 18", 20" and 21" tile, with three lid sizes, and in two weights. ● Write for catalog and further information.

FORD METER BOX CO.,
SETTING AND TESTING EQUIPMENT FOR WATER METERS
WABASH, INDIANA

TODAY'S TREND
●
is toward the use of ferric salts for water and sewage treatment.

FERRI-FLOC is a SUPERIOR coagulant that is more ECONOMICAL — more EFFICIENT and SIMPLER to use.

Write today for literature.

Ferri-Floc
TC Tennessee Corporation
FERRIC SULPHATE

Tennessee Corporation
ATLANTA, GA. LOCKLAND, OHIO

WATERPLUG

1. For control of water pressure when running or seeping through cracks and other defects in masonry.
2. For caulking and sealing around pipes or other appliances which pierce masonry walls of tanks, sludge basins or foundations.
3. WATERPLUG is prepared ready for use by the addition of mixing water only. It hardens quickly and is permanent.
4. WATERPLUG protects lead, copper, brass and other pipes, subject to corrosion from free alkali in cements.
5. Troublesome water problems can be solved quickly and permanently.

For free advice and methods of correction, please address

Standard Dry Wall Products, Inc.
BOX X NEW EAGLE, PENNA.

EDSON'S NEW HAND PUMP

Smallest Diaphragm Pump Made, 2" Suction Open Discharge. Capacity 1400 G.P.H. Weight 50 lbs. Size No. 1.

THE EDSON CORP'N
49 "D" Street
So. Boston, Mass.

NEW YORK: 142 Ashland Pl., Brooklyn

Catalog "T" Gives Full Data, Also Edson Hand and Power Pumps, Suction Hose and Pump Accessories

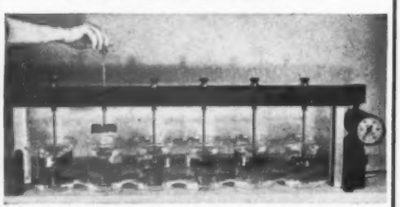
ANTHRAFILT

A Filter Medium For All Purposes

ANTHRACITE EQUIPMENT CORP.
19 Rector St. New York

H. G. Turner Research Engineer
STATE COLLEGE, PA.

THE Phipps & Bird LABORATORY MIXER . . .



IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

PHIPPS & BIRD, INC. Richmond, Va.

The Meter-Master

RATE RECORDER FOR WATER METERS

Send For Literature

F. S. BRAINARD & CO.
240 Palm Street, Hartford, Conn.

Biofiltration System for Pearl Harbor

● The Dorr Company has received an order, carrying an A-1a priority rating for sewage treatment equipment for a plant to serve the U. S. Naval Hospital at Pearl Harbor, Hawaii. It is to be of the Biofiltration type, design capacity 2000, and will consist of a Dorr Clarigester, combining primary sedimentation and sludge digestion, a Dorr-co Distributor for a circular trickling filter, a secondary Dorr Clarifier and various pumps and other accessories.

Dorr Co., reports that within one week after receipt of the order 22 new drawings for the job had been completed and manufacture orders had been issued to the shops.

"Varec" Now Operates Own Foundry

● The furnaces of the new "VAREC" Foundry are now in full operation following the dedication ceremonies recently. In line with the expansion program initiated by Frank V. Long, president of The Vapor Recovery Systems Company, Compton, California, manufacturers of sewage gas control and safety devices, the foundry is the fifth integral unit to be added in recent months. The warehouse, enlarged machine shop, welding and shipping units were completed early in October. All "VAREC" products are now manufactured "under one roof," thus insuring "VAREC" uniformity throughout.

U. S. Pipe Net Up to $2,614,586

U. S. Pipe and Foundry Co. reports a net income for 1941 of $2,614,586, after depreciation, amortization and taxes. Equivalent to $3.76 per share, this compares with a net of $2,403,804, or $3.45 per share, for the year previous.

To the Federal government, as Federal income and excess profits tax, U. S. Pipe paid $2,795,000 for 1941, these two taxes alone more than equalling net income.

J-M Makes Director of Research a Vice-President

Dr. C. F. Rassweiler, who joined Johns-Manville last June as director of research, was appointed a vice-president of Johns-Manville Corporation.

In his new office, Dr. Rassweiler will continue in charge of the company's research and development activities, which are now very largely devoted to converting the full production capacity of Johns-Manville to war uses.

Johns-Manville's research laboratories are located in Manville, N. J., and are managed by E. R. Williams, who will continue in that capacity.

WESTON

GASKET AND FORM
The Perfected Method for Making SEWER PIPE JOINTS OF CEMENT

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON Adams, Mass.

PHOENIX DISC WATER METERS

FEATURING
SPIRAL GEARS
(A Phoenix Patent)

Have an Excellent Record of Dependable — Accurate Service *Since 1914.*

Repair Parts for Water Meters
We furnish Parts for UNION KING METERS
Send inquiries for prices.

PHOENIX METER CORP.
PRINCE BAY, S. I. NEW YORK, N. Y.

Complete Sewer Cleaning Equipment

Before you clean your sewers, don't fail to investigate our equipment. We supply a complete line of sewer cleaning apparatus — machines, sewer rods, cleaning tools. Machines may be purchased or leased.

Sewer rods and hand tools sent on free trial.

Manufacturing Sewer Cleaning Equipment Since 1901

Write for Catalog

W. H. STEWART
Box 247 Syracuse, N. Y.
Box 251 Jacksonville, Fla.

SERVICE GEARED TO THE MODERN BUSINESS MANS NEEDS

and contact me at the Multnomah in Portland. Sincerely Yours. A. J. Smi HM-2

hotel MULTNOMAH
PORTLAND, OREGON

A WAR MESSAGE
to
ALL EMPLOYERS

★ From the United States Treasury Department ★

WINNING THIS WAR is going to take the mightiest effort America has ever made—in men, in materials, and in money! Every dollar, every dime that is not urgently needed for the civilian necessities of food, clothing, and shelter, must, if we are to secure final Victory, be put into the war effort.

An important part of the billions required to produce the planes, tanks, ships, and guns our Army and Navy need must come from the sale of Defense Bonds. Only by regular, week by week, pay-day by pay-day investment of the American people can this be done.

This is the American way to win. This is the way to preserve our democratic way of life.

Facing these facts, your Government needs, urgently, your cooperation with your employees in *immediately* enrolling them in a

PAY-ROLL SAVINGS PLAN

The Pay-Roll Savings Plan is simple and efficient. It provides, simply, for regular purchases by your employees of United States Defense Bonds through systematic—yet voluntary—pay-roll allotments. All you do is hold the total funds collected from these pay-roll allotments in a separate account and deliver a Defense Bond to the employee each time his allotments accumulate to an amount sufficient to purchase a Bond.

The Pay-Roll Savings Plan has the approval of the American Federation of Labor, the Congress for Industrial Organization, and the Railroad Brotherhoods. It is now in effect in several thousand companies varying in number of employees from 3 to over 10,000.

In sending the coupon below, you are under no obligation, other than your own interest in the future of your country, to install the Plan after you have given it your consideration. You will receive—1, a booklet describing how the Plan works; 2, samples of free literature furnished to companies installing the Plan; 3, a sample employee Pay-Roll Savings authorization card; and 4, the name of your State Defense Bond administrator who can supply experienced aid in setting up the Plan.

To get full facts, send the coupon below —today! Or write, Treasury Department, Section B, 709 Twelfth St., NW., Washington, D. C.

HOW THE PAY-ROLL SAVINGS PLAN HELPS YOUR COUNTRY

1. It provides immediate cash now to produce the finest, deadliest fighting equipment an Army and Navy ever needed to win.
2. It gives every American wage earner the opportunity for financial participation in National Defense.
3. By storing up wages, it will reduce the current demand for consumer goods while they are scarce, thus retarding inflation.
4. It reduces the percentage of Defense financing that must be placed with banks, thus putting our emergency financing on a sounder basis.
5. It builds a reserve buying power for the post-war purchase of civilian goods to keep our factories running after the war.
6. It helps your employees provide for their future.

MAIL THIS COUPON NOW

Treasury Department, Section B
709–12th St., NW.
Washington, D. C.

We want to do our part. Please rush full information regarding the Pay-Roll Savings Plan.

NAME .....
POSITION .....
COMPANY NAME .....
ADDRESS .....
NUMBER OF EMPLOYEES .....

MAKE EVERY PAY-DAY . . . BOND DAY!
U. S. Defense BONDS ★ STAMPS

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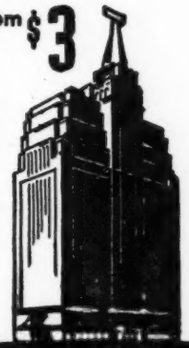

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•

Rumors to the effect that increasing use of hypochlorites in direct defense and other government uses *may* result in a shortage for water treatment uses, even under the seemingly satisfactory A2 priorities rating, have recently gained momentum to the point that some users and prospective users of hypochlorites have shown marked concern for the future of the Hypochlorination Process.

Fortunately for all concerned these disturbing rumors have been refuted in a statement released by the Division of Chemical Priorities of the War Production Board under date of January 27th, 1942, was conspicuously publicized in "The Journal of Commerce" of January 28th, and subsequently appeared in the daily press and current trade journals. This release (WPB-54) states—

"CHLORINE IN ALL FORMS for water and sewage treatment is given high preference over other civilian and some war uses."

Should the dry high-test hypochlorites become temporarily difficult to procure W.P.B. suggests the substitution of widely available liquid Sodium Hypochlorite. This product, very simply made from liquid chlorine and caustic soda, is in common production within ready shipping distance of every community in the U. S. A. and—

Sources will be gladly supplied by % PROPORTIONEERS, INC., % to any inquirer.

If further current facts are desired concerning the availability of dry high-test hypochlorites ask—

(1) Pennsylvania Salt Mfg. Co., Philadelphia (Manufacturers of Perchloron)

(2) Mathieson Alkali Works, New York City (Manufacturers of H.T.H.)

Consider also the many widely located producers of Sodium Hypochlorite for laundry, household, general bleaching and sanitary uses some of which are marketed under such trade names as "Clorox," "Klenzade," "Wilclor," "Merclor" etc., there being in addition thousands of smaller hypochlorite producers supply intra-zone users by truck delivery in carboys and drums.

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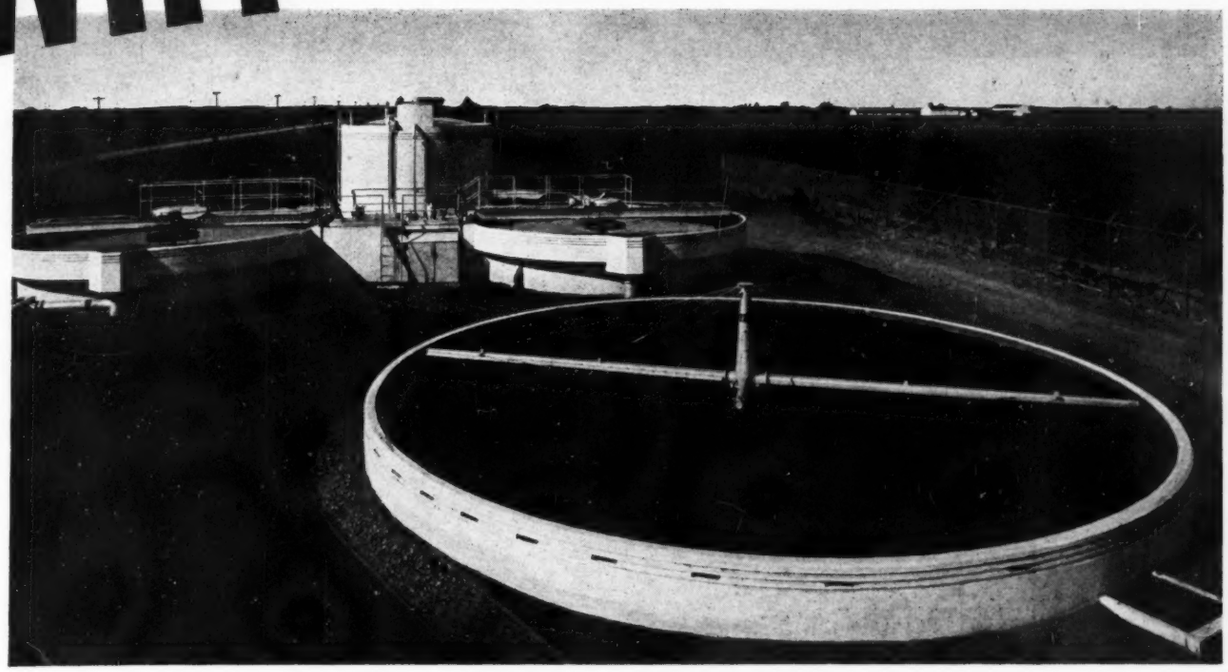

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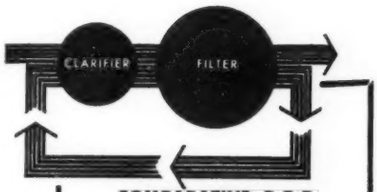

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With and Without Recirculation

	Single Stage Without Recirculation	With Recirculation
Infl.—B.O.D. P.P.M.	774	644
Effl.—B.O.D. P.P.M.	169	53
B.O.D. Reduction—Percent	78.1%	91.8%

Two Stage With Recirculation	
Infl.—B.O.D., P.P.M.	576
Effl.—B.O.D., P.P.M.	14
B.O.D. Reduction—Percent	97.6%

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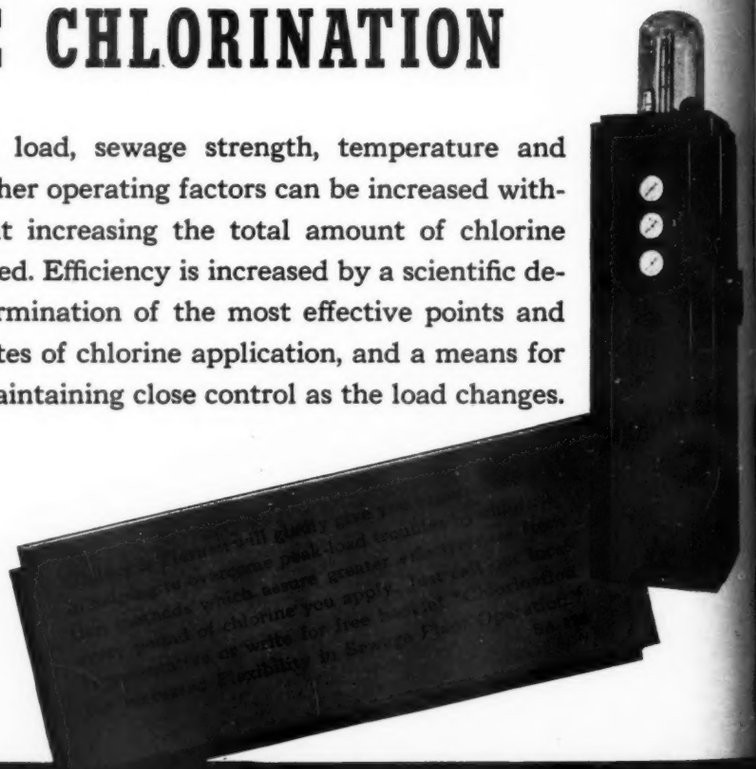
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